ON THE TOP OF THE WORLD

L. BRONTMAN:

ON THE TOP OF THE WORLD

THE SOVIET EXPEDITION
TO THE NORTH POLE 1937

Edited and with a Foreword by

Academician O. J. SCHMIDT

Hero of the Soviet Union

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FOREWORD

FOREWORD

THE OLD PROBLEM of reaching the North Pole has interested humanity for centuries. Many were the heroic attempts made by the best representatives of different countries. Many, too, were the explorers who, battling with the elements, fell victims to them. Humanity will never forget the history of Arctic and Antarctic exploration. The names of Nansen, Franklin, Peary, Scott, Amundsen, Byrd and many others are names to be proud of—the best sons of humanity.

The North Pole, as is well known, was reached by Robert Peary in 1909. But not long after, it was realised that this solved only part of the task. Peary and other explorers who had penetrated the North learned much about the geography of the Arctic, but their information was necessarily fragmentary, disconnected. For instance, Peary was able to spend only one whole day at the Pole. But modern science is not satisfied with fragmentary data. To arrive at its generalisations science requires a tremendous volume of material, gathered day by day, uninterruptedly. That is why scientists of all countries long ago came to the conclusion that it was necessary to change from isolated expeditions to a systematic study of the Arctic and to the creation of permanent scientific stations, or at least stations organised for long periods, that would study the weather, the currents, geology, biology, etc., according to a single, definite plan.

It has become possible to realise these aspirations on a really large scale in the U.S.S.R., a country whose Government, widely and ardently supported by all categories of

the population, has provided highly technical equipment (ice-breakers and aeroplanes) and unlimited financial means for Arctic exploration. In the U.S.S.R. exploration of the Arctic has become a component part of the famous Five Year Plans—of the great plans for the development of the productive forces of the country on the basis of scientific study.

Exploration of Arctic seas and lands progressed particularly quickly beginning with 1929, that is, at the time the well-known First Five Year Plan came into operation. Many were the famous expeditions made with ice-breakers; the Northern sea route, which followed the shores of Asia, was opened for regular navigation; scores of Arctic stations were founded. But nature yielded her secrets only after a cruel struggle. Everyone remembers the catastrophe that befell the Cheliuskin expedition in February 1934 and the mighty efforts of the country to save the members of the expedition—efforts which were crowned with complete success. All of the 104 people who were stranded on a drifting ice-floe after the steamer sank, were saved by pilots who deservedly received the title of Heroes of the Soviet Union.

Following a long period of preparation, the time came to crown the work of mastering the Central Arctic Basin, including the North Pole itself. We went after the Pole energetically. The idea of merely visiting the Pole or of flying across it did not satisfy us. We wanted to settle at the Pole, to study the Central Arctic Basin thoroughly; to render it habitable and to use the information obtained in order to add the Arctic to the general economic and cultural wealth of our country and of all humanity. First of all, a study of the Pole was to help—and it actually did help—flights from the U.S.S.R. to North America across the North Pole.

With the permission of the Government we decided to organise a scientific station on a drifting ice-floe in the region of the Pole. We flew North. All of the 'planes landed at the Pole, a station was established on the drifting floe, and the 'planes returned without losing a single person and without a single accident.

This undertaking was carried through successfully and with certitude as a result of the excellent training of the participants, their exact knowledge of their goal and their unswerving will to fulfil the tasks set by our dear fatherland.

This book has been written by one of the participants in the expedition. It is a simple and modest record of the progress of the expedition and of the people who took part in it. Do not look for exciting catastrophes in this book, or for descriptions of disasters that overtook people in an uneven fight against nature. Nature subordinates herself to man when he knows how to arm himself for the fight and when he does not come out alone, but in a large group supported by the warm love of millions of citizens. And in this case nature had to yield, and sign an honourable treaty of peace with man. . . .

The author, L. Brontman, a journalist, gives us a conscientious description. He does not exaggerate things; rather, he is prone to emphasise the details of the prosaic, every-day life, the persistence, the friendship of people, the modest fulfilment of duty. The author depicts my dear friends, members of the expedition, as modest and simple men. This is undoubtedly true, just as it is true that these modest people were real heroes, representatives of a country that is solving not only its own problems, but also those of all progressive humanity.

PROFESSOR O. SCHMIDT,
Member of the Academy of Sciences of the U.S.S.R.

ON THE TOP OF THE WORLD

I

WHY WE FLEW TO THE NORTH POLE

ON MAY 5TH, 1937, the Soviet aeroplane USSR N–166, piloted by Golovin, circled over the North Pole, then veiled by a heavy curtain of clouds, and returned to Rudolf Land. On May 21st a heavy four-engined machine, piloted by Michael Vodopianov, effected a successful landing at the North Pole. The others in the 'plane were Professor Otto Schmidt, head of the Soviet expedition to the North Pole; Spirin, navigating officer; Babushkin, pilot; Papanin and a team of scientists, mechanics and wireless operators. A Soviet scientific station for Polar research was established on a drifting ice-floe. On May 26th the three other four-engined aeroplanes of the Soviet Polar expedition reached the North Pole, carrying 10½ tons of supplies for the Polar station in the shape of scientific instruments, equipment and food. Thirty-five Soviet citizens remained at the North Pole, some for eleven and others for sixteen days, making a valuable series of scientific observations. Subsequently the aeroplanes flew back to Rudolf Land and thence back to Moscow.

Four men stayed behind on the ice: Ivan Papanin, chief of the station at the North Pole; Ernst Krenkel, wireless-operator; Peter Shirshov, hydrologist; and Eugene Feodorov, magnetologist. They were to spend long months in the centre of the Polar basin studying that mysterious region and endeavouring to fathom the age-old secrets of the central Arctic.

What induced these men to fly to the North Pole, what induced them to stay there alone in the Arctic Ocean? What were Soviet citizens doing in the Arctic?

For ages mankind has aspired to reach the top of the world—the North Pole. Attempts to penetrate to the heart of the Arctic have a long and tragic history; the road to the North is strewn with the bones of many courageous explorers. Scientists and traders, soldiers and adventurers have followed the trail of the North, suffering terrible privations, many perishing in the struggle with ruthless nature, but still they strained forward, stubborn and unflinching. Like a gigantic magnet, the North Pole has irresistibly drawn to itself the dreams of men.

In the year 325 B.C. Pytheas, a Greek of Massalia, opened up the route to the North, bringing his frail craft into the North Atlantic and reaching the Scottish Isles. Nearly a thousand years later the Normans and Vikings sailed Northwards. But serious attempts to reach the far Arctic regions were not made before the sixteenth century. Seeking new sea routes to India and China, English and Dutch merchants began to explore the possibilities of reaching distant lands by way of the Arctic seas. In 1553 the "Company of Merchant Adventurers for the discovery of countries, lands, islands, States and Empires hitherto unknown and unvisited by way of the seas" fitted out a special expedition to sail to China through Northern latitudes. It started out from Ratcliff with three ships under the command of Sir Hugh Willoughby. Two ships of the expedition wintered on the Murmansk coast, but the whole crew perished of cold and scurvy. The third ship reached the mouth of the Northern Dvina and opened up trade with Muscovy.

Many other expeditions made the attempt to discover a North-East passage. Dozens of ships sailed away to the Far North, wintered there and returned or perished

without a trace, but it was only at the end of last century that Nordenskjöld succeeded in sailing along the Northern coasts of Europe and Asia during two navigation periods. Of course a voyage lasting two years could give no economic results. Further attempts to improve on Nordenskjöld's achievement were unsuccessful, and it was only in 1932 that the Soviet ice-breaker *Sibiriakov*, commanded by Otto Schmidt and Captain Voronin, made the voyage from Archangel to the Pacific in one navigation period, thus opening up the great Northern sea-route along which whole caravans of merchant ships now sail.

No less dramatic is the history of the conquest of the North Pole. Many attempts have been made to reach the point where the meridians of the earth intersect, and many means have been tried—dog-sledges, ships, aeroplanes and even submarines. Penetrating further and further North, explorers discovered new lands and islands, investigated the waters and currents of the Arctic Ocean, and studied its plant and animal life. But for almost a century and a half not a single journey to the Pole reached its destination. Frithjof Nansen, the great Polar explorer, tried to reach the Pole by driving his ship *Fram* into the drifting ice and moving along with the drift. Nansen's idea proved to be correct in principle but not in its application. The drift ice passed 300 miles more to the South than Nansen expected. Seeing that the drift deviated towards the South, Nansen made a valiant effort to reach the Pole by dog-sledge. Battling with tremendous difficulties he succeeded in reaching 86° 14′ North, from which point he and his companion Johansen turned off to Franz Josef Land, wintered there and next year returned to Norway. A few years later the Duke of the Abruzzi led an Italian expedition to the North, and a section led by Captain Cagni, in attempting to reach the Pole, advanced thirty-seven kilometres

beyond Nansen's last camp and then returned, having lost three men. In contrast to the Nansen expedition, which collected much exceptionally valuable material, the Cagni expedition did not distinguish itself by scientific achievements.

Equally unsuccessful, but even more tragic, was the first attempt to reach the Pole by air. In 1897 Salomon André, a Swedish engineer, started out for the North Pole from Spitzbergen in a balloon, the *Eagle*. With him were Strindberg, a physicist, and Frenkel, an engineer. The fate of the expedition remained an unsolved mystery for many years. It was known only that after eight hours' flight André had thrown out on the ice a small buoy with a message inside. (This buoy was found three years later on the Northern coast of Norway.) The next day André released a carrier-pigeon, which was soon caught by a Norwegian merchant ship. It was only in the summer of 1930 that a Norwegian expedition accidentally discovered the bodies of André and his companions on White Island. Beside them lay notebooks, diaries, equipment, clothing, weapons and food. Judging by the notes in the diaries, the flight had been full of unfortunate accidents. Almost immediately after the start the guide-ropes broke, and very soon gas began to leak from the envelope. The gondola hit the ice several times. On the third day of the flight André opened the air-valves and landed at 82° 56′ North. The explorers set out on foot for Franz Josef Land. A strong drift carried them from their course. With superhuman efforts they at last reached White Island, where they perished.

The first to reach the North Pole was Robert Peary, the American explorer, who devoted twenty-three years of his life to the pursuit of this aim. Carefully and methodically he stormed the approaches to the centre of the Arctic,

advancing steadily deeper into the Polar basin. Peary accumulated great experience of travelling in the Arctic, and especially of the use of dog-sledges. At last in 1909 Robert Peary reached his coveted goal. After staying about thirty hours at the Pole Peary hurried back, as he feared the approach of the Polar spring and the exhaustion of his scanty food reserves. The courageous American failed almost completely to secure any scientific observations. The line with which he tried to fathom the depth of the ocean broke without reaching the bottom after he had paid out 2,742 metres. The main result of Peary's journey was that it refuted the numerous theories then current on the nature of the centre of the Arctic Ocean. Some scientists assumed the existence of land there, others thought that it was free of ice. Peary, however, found that the North Pole was covered with ice and in no way differed from the surrounding parts of the Polar basin.

Among the many subsequent attempts to reach the Pole was the venture of a Russian Polar explorer, Lieutenant George Sedov, who set out in 1912 with his ship, the *St. Phokas*. Heavy ice compelled the expedition to winter on Novaya Zemlya. The following year the ship reached Franz Josef Land and again wintered at Hooker's Island in a bay which Sedov christened Pacific Bay. During the winter all the members of the expedition, including Sedov himself, fell ill with scurvy. In spite of this, on February 15th, 1914, Sedov and two sailors started out on foot for the Pole. Sedov's illness grew worse, and on the seventh day he was compelled to lie down on the food sledge; nevertheless, he continued his northward journey. However, his health became steadily worse, and the expedition was forced to camp before reaching Rudolf Land. For three days a ferocious blizzard shook the tent in which Sedov lay dying. The sailors did all they could for him, using a

Primus to keep him warm, but on March 5th he died. His companions buried him and returned to their base with the greatest difficulty.

With the development of aviation attempts to reach the North Pole increased. In 1925 the great Polar explorer Roald Amundsen tried to reach the North Pole with two aeroplanes, but at 87° 44′ North he had to make a forced landing. One of the 'planes crashed, but the other brought Amundsen and his companions back after an incredible struggle. A year later Byrd, the American airman, flew from Spitzbergen to the Pole and returned without landing. Two days after Byrd the airship *Norway* flew over the Pole with Amundsen, Nobile and other members of the expedition. Nobile's second expedition with the airship *Italia* in 1928 ended in the disaster on the coast of Spitzbergen which is still fresh in the memory. Part of the crew was saved by Soviet airmen and by the Soviet ice-breaker, *Krassin.*

So we see that men have been on and over the Pole before the expedition of 1937.

However, they could do nothing except just reach the Pole. The central Arctic region remained, as before, merely a white spot in science as in geography. The Soviet explorers were the first to solve its mysteries and wipe the white spot from the map of the earth.

Slowly and methodically, following a carefully thought-out plan, the Bolsheviks explored the North. The onslaught on the Arctic was carried out simultaneously by ice-breakers, aeroplanes and the whole arsenal of technical resources at the disposal of the Soviet Government. On the coasts and islands of the Arctic Ocean scientific stations were established one after the other. The stations studied the weather, the currents, the ice of the Polar basin (Pacific Bay, Novaya Zemlya, Cape Cheliuskin, Severnaya Zemlya,

New Siberia Islands, Wrangel Island, etc.). Year after year powerful ice-breakers, ships strengthened for ice, and special scientific research vessels went out to establish new stations, discover new islands and carry on the complex work of studying Arctic conditions. This work was not abstract theorising. All the activities of the Soviet Polar research workers were subordinated to a precise scheme for the conquest of the Arctic, and the bringing of its resources into the general orbit of the Soviet Union's economic plan.

The voyages of the *Sibiriakov* and *Cheliuskin*, the observations made by the Polar stations, and the results of the work of many expeditions made it possible to turn the great Northern sea route into a normal highway of traffic. This highway brought new life to the regions of the Far North, brought new industries into existence, and carried a new civilisation to the numerous national groups of the North. Ports and factories, coal and ore mines sprang up on the desert coasts of the Arctic Ocean; schools, clubs, theatres and hospitals were built, new towns and villages came into being.

Step by step the Soviet's Arctic explorers closed in on the central Polar basin. New citadels of science were set up in the North, under the leadership of Professor Otto Schmidt. In general the whole history of the conquest of the Arctic by the Bolsheviks is closely linked with the name of Otto Schmidt. He took part personally in the most important and responsible expeditions and deservedly earned for himself the solid reputation of the foremost Arctic expert of our time. Schmidt was in charge of the first expeditions to Franz Josef Land and Severnaya Zemlya; he was in command of the *Sibiriakov* and *Cheliuskin* voyages; and it was under his direction that the intricate operation of moving an entire trading caravan from the West to the

East by the Northern sea route was carried out in 1936. And it was not by chance that Otto Schmidt headed the Soviet air expedition to the North Pole.

The Soviet forces moved forward to storm the North Pole only when a strong base had been established in the Arctic for a further onslaught on the central Polar basin, and only when the lack of the necessary information concerning the North Pole began to hamper the further development of work in the Arctic. The Soviet Union needed the North Pole, and therefore undertook the task of mastering it.

The problem was not merely to reach the North Pole. With the present level of Soviet aviation such an enterprise might have been difficult but quite feasible even several years earlier. But a simple flight to the Pole would have given neither scientific nor practical results. Consequently, the Soviet Government decided to send to the Pole a whole fleet of aeroplanes, which would not only reach the Pole but carry there a complete scientific station with the necessary instruments and equipment—in other words, to achieve the conquest of the North Pole and carry out the most complete survey of the central part of the Polar basin possible at the present time. The fulfilment of this difficult and intricate task was entrusted to the Northern Sea Route Commission.

Why was the Soviet expedition interested in the North Pole? They wanted concrete knowledge of the weather in the Polar region, its fluctuations and seasonal changes, the effects of varying conditions, the influence of Polar weather on the climates of Europe and Asia. They wanted to discover the laws that govern the drift of ice in the Polar basin, the nature and direction of the currents and the marine life of the Arctic Ocean. The programme of work for the station which the aeroplanes were to establish on the Polar ice included geophysical problems,

observations of terrestrial magnetism and astronomical observations. The significance of this work is exceptionally great. The results will not only enrich Soviet and indeed world science but will have immediate practical applications. Knowledge of the laws of the ice-drift and of the currents will make possible new solutions of the problems of navigation along the Northern sea route. Data of weather conditions in the Arctic will permit a more exact weather forecast for longer periods throughout the territory of the Soviet Union. The determination of the magnitude of magnetic deviation in the central Arctic region will make air navigation in high latitudes a much easier matter. Finally the existence of a scientific station at the Pole will lay the foundations for the organisation of trans-Polar air lines connecting Europe and America.

It is well known that flights from Europe to America by way of the Atlantic Ocean are very difficult owing to the unfavourable meteorological conditions. All attempts to establish regular air communications have up to the present been unsuccessful. Flights across the Arctic centre are not only easier but considerably shorter. Their practical realisation had been hampered by insufficient knowledge of the conditions prevailing in the centre of the Arctic Ocean. The establishment at the North Pole of a weather station giving regular weather reports has considerably simplified the problem. And we see that, a month after the landing of the scientific expedition on the ice, Valerius Chkalov, George Baidukov and Alexander Beliakov used these reports to fly from Moscow to North America over the North Pole, blazing an air trail between the two continents. A second Soviet 'plane piloted by Michael Gromov, Andrei Yumashev and Sergei Danilin confirmed the feasibility of the new route, and incidentally beat the previous non-stop distance flight record. The time is no longer distant when, along

the route opened by Soviet aeroplanes, air expresses will ply carrying passengers, mail and freight. The presence and energetic work of the Soviet scientists at the North Pole, and the successes of Soviet and U.S.A. aviation, fully justify such hopes.

Of course the schedule of scientific work planned by the Polar explorers now camping on the top of the world is not restricted to the subjects mentioned above. Their programme is very broad and detailed. Here we mention a few of the most important sections of the scientific activities projected for the winter. It is well known that weather conditions in Europe and Asia are closely connected with the atmospheric processes of the Polar region. The mingling of masses of cold air from the North with the warm air of the South has very complex results. Currents of Arctic air often flow down to the sub-tropics, bringing a lowering of temperatures and weather changes. In winter the fall in temperature may bring severe frost; summer droughts are also connected with the movements of Arctic air. The observations made by the explorers during the winter will, it is hoped, reveal the laws governing the movement of the masses of Arctic air, provide answers to many unsolved questions of meteorology; they will help towards more exact weather forecasts both in Europe and Asia, and forecasts, too, for longer periods ahead.

The hydrological work of the station will be of no less importance. Forty years ago Nansen found that the Atlantic empties into the Arctic Ocean a mighty stream of more salt and comparatively warmer water. But the observations of the *Fram* were taken at the edge of the Polar basin, and no one knew to what extent the results were applicable also to the central region of the Arctic Ocean. The hydrological conditions existing in the central Arctic region were absolutely unknown until quite recently; it was therefore not

known how much water from the Atlantic, and with it how much warmth, was received by the Polar basin, and how this influenced the formation, nature and movements of Polar ice. No one knew the depth of the Arctic Ocean. It was assumed that there was little life in the waters of the central Arctic because the sea there was eternally covered with a heavy coat of ice and darkness prevailed for nearly six months each year.

The very first days spent at the Pole by the expedition showed that this view was incorrect and that the assumption that there was also no life on the surface of the ice covering the Pole was equally untenable. We shall see that the expedition has taken from the water a great quantity of plankton and other minute organisms, and that birds, reindeer and bears have been observed. The manifold instruments used by the expedition will permit us to form a clear picture of life on the surface of the Arctic Ocean and in its depths, to measure that depth, ascertain the formation of the bottom and collect data showing the force, extent and specific features of the warm and cold currents of the Arctic Ocean.

Systematic astronomical and magnetological observations constitute one of the most important sections of the station's work. As a result of these observations a magnetic chart of the central Arctic will be drafted—we shall know the declinations, aberrations and magnitudes of the horizontal component of terrestrial magnetism and the magnetic variations will be cleared up. Of great interest also are the measurements of the force of gravitation near the Pole. The force of attraction of the earth varies in different places. A comparison of the magnitudes of that force will permit us to calculate the exact shape of the earth, a knowledge of which plays such an essential part in many geodesic and astronomical reckonings. In addition, the results of these

gravitation observations will throw light on the geological structure of the Arctic.

The responsibility for carrying out this extensive programme was placed on four men: Papanin, Krenkel, Shirshov and Feodorov. Every one of them has visited the Arctic many times, wintering in Arctic stations and doing much important difficult work. Papanin is known for his inexhaustible energy, splendid administrative abilities, unbending determination and cheerfulness—a most suitable chief for the winter station. Ernst Krenkel, tall and well-built, is rightly regarded as the father of wireless in the Arctic and as a pioneer of the Soviet conquest of the Arctic. Shirshov and Feodorov are gifted representatives of the young generation of Soviet scientists who combine a passion for research with great experience and profound theoretical erudition.

The preparations for the expedition to the North Pole were made with the greatest care and attention. The idea of establishing a scientific station on an ice-floe, first conceived by Nansen, had been often discussed among Soviet Arctic experts. Not only the Northern Sea Route Commission and its chief, Professor Otto Schmidt, but dozens of other Polar experts, scientists, airmen, and staffs of winter stations had for long been dreaming of such a possibility. Schmidt wrote: "The idea matured among us by degrees, incorporating the results of the vast collective experience of studying and mastering the North."

Five years ago, at the time of the *Sibiriakov* voyage, in 1932, Schmidt discussed with the other members of the expedition the view that a longer study of Polar conditions was an imperative necessity. During the long nights of their stay in the ice-camp after the wreck of the *Cheliuskin* in the Chukotsk Sea the Polar experts often returned to this subject, putting forward various schemes and theories. The most ardent champions of the idea of spending the



1

IN THE STREET AT NARIAN-MAR
A child driving a dog sledge

winter at the Pole were Ernst Krenkel and Peter Shirshov —their enthusiasm was hardly less than that of the Bolshevik leader of the expedition. Then and there, on the ice-floe, they both officially requested Schmidt to put them down as first claimants for places in the proposed group for wintering on the ice. Undoubtedly their eight-week stay on the floes of the Chukotsk Sea gave them excellent experience of camping on floating ice—experience which they could have hardly obtained in any other way. As the proverb has it, every cloud has a silver lining.

Another ardent partisan of flights into the Arctic was Michael Vodopianov. In recent years his name has become inseparable from the Arctic. Many of the most important flights to the North were carried out by Vodopianov himself or in close co-operation with him. The life history of this pilot is exceptional and full of colour. Like the life history of Molokov, Vodopianov's story is typical of the story of hundreds of thousands of Soviet citizens. "In my childhood I dreamt of being a shepherd," Vodopianov wrote in his memoirs, "but the revolution prevented the fulfilment of this dream." The revolution turned the former illiterate herd-boy into an air mechanic, pilot, flying instructor, pilot of international rank and fame and finally won him the title of Hero of the Soviet Union and a place in the Central Executive Committee of the U.S.S.R. Vodopianov took part in the rescue of the Cheliuskin expedition; he was the first to fly from Moscow to Chukotka in winter, and amongst airmen he was the first to take up the idea of the conquest of the North Pole. Of gigantic build, daring yet cautious, he combines in himself a Bolshevik devotion to his ideals with imagination, drive and ingenuity.

He was the man Schmidt chose in 1935 to prepare a technical plan for a flight to the North Pole and for wintering there. On the agreed date Vodopianov brought Schmidt

a novel entitled *A Pilot's Dream*, in which he had worked out the technical details of the flight in a vivid and gifted form. On February 13th, 1936, Schmidt was invited to a conference with Stalin in the Kremlin to discuss the organisation of trans-Polar flights. In addition to Schmidt, Levanevski, Gromov, and other prominent Soviet airmen also took part in the conference. Stalin insisted that, important as trans-Polar and other long-distance flights might be, it was even more important to safeguard the human element, and that flights should be permitted only if every possible care had been taken to minimise the risks involved.

Schmidt used this opportunity to explain the plan he had worked out, for sending an air expedition to the Pole and setting up a station there. Stalin and Voroshilov enquired into every detail of the plan, and then Stalin fetched a globe and asked Schmidt to give a concrete demonstration of where he wanted to go and what he wanted to do. The upshot was a Government decision that the Northern Sea Route Commission was to organise an expedition to the region of the North Pole in 1937, and that equipment for a scientific station and a wintering party were to be taken there by aeroplanes. Schmidt was put in charge of the whole scheme. The People's Commissariat for Heavy Industry was to produce the aeroplanes needed for the expedition.

After a careful study of all possible alternatives, the Northern Sea Route Commission decided to establish a base for the attack on the Pole on one of the islands of Franz Josef Land, probably on Rudolf Land. But the conditions of aerodrome construction and flight in those Northern latitudes had to be studied on the spot, and with this object in view Vodopianov and another airman, Makhotkin, set out in the spring of 1936 to fly from Moscow to Franz Josef Land. The flight was exceptionally difficult

and complicated. For the first time in the history of Arctic aviation, aeroplanes opened an air route from the continent to the distant archipelago. Snowstorms, clouds and bad visibility on several occasions compelled the airmen to turn back or land and wait for better weather. During the last stage of the flight, from Cape Jelaniya to Pacific Bay, Vodopianov made a forced landing on Graham Bell Land, which is uninhabited. After waiting here several days for better weather, Vodopianov flew across to Pacific Bay and from there undertook several reconnaissance flights northwards, visiting Rudolf Land which he ascertained was completely suitable as a base for the air expedition.

Rudolf Land lies between 81° 41′ and 81° 50′ North and between 57° 50′ and 59° East. It is the most Northern island of Franz Josef Land and at the same time the Northernmost point of land in the Soviet sector of the Arctic region. This distant island, only 600 miles from the Pole, has been known to explorers for more than sixty years. It was discovered on April 12th, 1874, when the Austrian expedition of Waprecht and Peier visited Franz Josef Land. A quarter of a century passed before men again trod the grim icy ravines of the island. It was here in Teplitz Bay that the *Stella Polare*, with the Italian expedition led by the Duke of the Abruzzi, spent the winter. From here Captain Cagni and his party went northward and reached 86° 34′ North in a journey lasting 104 days. In 1903 the *America*, of the American expedition led by Fiala, was crushed in the ice of the same bay. On three occasions Fiala set out northward with dog-sledges, but each time he returned after a few miles of heavy going. Finally here, on Cape Brorok, lie the bones of Sedov, buried by his companions after his unsuccessful effort to reach the Pole on foot.

Eight years ago a Soviet expedition led by O. Schmidt visited Rudolf Land on the ice-breaker *Sedov*. Three years

later the first Soviet Polar station was established on the island and a party of four wintered there.

This was the island chosen to serve as a base for the storming of the Pole. Nature on the island is inhospitable enough. The whole island is covered with an unbroken coat of ice, and only a small portion of the valley round Teplitz Bay loses its snow and ice in summer, laying bare its bleak stony soil. In the centre of the island there are several ice-hills, the tops of which form tolerably good natural aerodromes. The slopes of the hills are not too steep and give comparatively easy access to the future airports. The island is oval in shape and has an area of about 220 square kilometres. Its climate is as inhospitable as its external appearance. In winter, blizzards and snowstorms are frequent; in summer, fogs are almost continuous. The warmest month is July with a mean temperature of 0° centigrade.

In August 1936 the ice-breaker *Russanov* set out for the island with a cargo of building materials for the construction of a new Polar station, equipment for an aerodrome, fuel for aeroplanes, spare parts for the motors, provisions for wintering on the ice, scientific instruments, tractors, caterpillar lorries, etc. The future chief of the North Pole ice-floe station, Ivan Papanin, headed the expedition. Heavy ice, blocking the Northern part of the Barents Sea and the straits between the islands of Franz Josef Land, made progress difficult; it was repeatedly necessary to make detours in search of a channel. Twice they came close to Rudolf Land and were twice compelled to go back, as the channels were choked with ice. Finally at the third attempt the captain found a semblance of a bay in the wide ice waste surrounding the whole island. Between them and the shore stretched a mile of pack-ice and the spot chosen as the site of the base was another

mile and a half further inland. The condition of the inshore ice was such as to exclude any possibility of shifting cargo with tractors or lorries until a special roadway had been driven through. The larger ice-blocks were broken up with explosives, and the smaller ones were smashed by hand; bridges were thrown across crevices. But even so the road could hardly be called a model one. It zigzagged at angles of up to 35° and the bridges were none too solid. But the road-builders did the best they could, and as soon as it was ready they immediately "declared it open". Powerful tractors from the Stalingrad factory dragged along wooden sledges of ancient pattern loaded to capacity with all kinds of building material. Alongside them, ran the caterpillar lorries carrying breakable objects. According to plan the unloading was to have taken ten days. The team worked indefatigably and completed the job in five days. Leaving carpenters and mechanics on the shore, the ice-breaker moved to Pacific Bay where in the meantime the steamer *Herzen* had already arrived from Archangel with a second cargo of materials for the base. Quickly shifting the whole cargo into her own hold and filling up her bunkers, the *Russanov* again steamed northwards. Soon she cast anchor again in front of the familiar ice-pack, and the tractors again took up the work of transporting the cargo. All this time the construction of the station was proceeding at full blast. The members of the expedition and the *Russanov's* crew gave active help. On the deserted, gloomy shore of Teplitz Bay a whole village sprang into being. Two large living-huts were built, with eight rooms each, a roomy compound for livestock, a splendid bath-house, two storehouses for instruments and appliances, a food store, a general store, garages for the tractors and lorries, and engineering and joinery workshops. Close by, a 300-watt wireless station was erected, which was later to keep

in constant wireless contact with the winter station at the North Pole and with the continent.

Having unloaded her cargo, the *Russanov* returned home, leaving twenty-four persons to winter on the island—building workers, mechanics, airmen, with Jacob Libin as chief of the station. They completed the construction of the station itself, cleared, marked out and equipped an aerodrome on an ice-hill, carried 540 barrels of fuel up there and made all the necessary preparations to receive and assist the Northern air expedition.

Meanwhile in Moscow the aeroplanes, motors and equipment were made ready. The Gorbunov aeroplane factory was commissioned to get ready four powerful four-engined machines. The Frunze works were to give twenty engines; the Orjonikidze works began to get ready a large number of navigating and piloting instruments. At the same time a number of other factories, workshops and laboratories were working at the special ultra-modern wireless apparatus required for the flights. In its choice of the type of aeroplane the Polar Flight Office was guided by the practical conditions in which the machines were to work and by the tasks confronting the expedition. The aeroplanes were to carry to the North Pole about ten tons of miscellaneous cargo for the scientific station. Such a task could only be undertaken by machines possessing great carrying capacity and a wide flying range. In addition, these aeroplanes have a very low landing speed which was extremely important for use in places with imperfect and untried aerodromes.

The aeroplanes were carefully prepared for their long journey. First of all they were slightly altered, the pilot cabin being widened and room made in the fuselage to load equipment. In fitting out the machines, the engineers took into account the varied experience acquired by Soviet

aviation during its work in the North. A number of valuable improvements were made under the supervision of Gutovski, Bassein and Sugrobov, mechanics of the expedition; the object of these improvements was to increase the independence of each machine. Everything possible was done to ensure that the aeroplanes would be able to take off in any conditions when away from an aerodrome—from an ice-floe, from a Polar island, or after a forced landing, under any and every climatic condition and at any temperature. With this in view the motors were encased in special coverings which would keep them warm for several hours. Instead of water a special anti-freeze mixture was used in the cooling system to prevent freezing even at extremely low temperatures. For the warming-up of the motors powerful warming lamps were fitted; they proved extremely useful later. At Vodopianov's suggestion, all machines were fitted with a so-called "*communicator*", making it possible to warm up one motor by the action of the other. The motors were built and tuned with this fundamental object in view: that they should work under all conditions that might be met with in the North.

Foreseeing the possibility of a forced landing, all machines were painted a bright orange. An aeroplane of the usual colour is very difficult to see on the uniform and monotonous surface of snow or ice. Orange stands out sharply against it, and is excellent for the purpose, as we found on several occasions in the course of the expedition.

Most of the improvements were made at the suggestion of Bassein, the mechanic. He had given his whole energies to the Arctic, and had very great experience in Polar work, magnificent inventive powers and a clear head. Short, broad and strongly built, in spite of his thirty-five years he seemed only a youth. But this youth had had time to take part in the civil war, to work as a mechanic with the

first air unit of the Red Army, to fly a great deal and participate in the most important Northern flights. His technical knowledge was often of the greatest service to the expedition during the flight.

Special attention was given to the air-navigation equipment. Major Ivan Spirin was head of the navigation department. In the Soviet Air Force he was regarded as one of the most gifted and experienced experts. It was usually Spirin who was commissioned to direct the performance of the Air Force during air parades over Moscow. Now he brought all his varied experience and splendid knowledge into play to help on the work of preparation. The air-navigation equipment of the 'planes was perfect.

As no one could say in advance how the magnetic compasses would work in the higher Arctic latitudes, the navigators provided for a number of other instruments which might take the place of the normal equipment if the latter ceased to work properly. In addition to radio-compasses, there were also hygroscopic instruments, sextants and direction finders. The wireless apparatus of the aeroplanes made it possible for them to keep in touch with all stations on the continent working on short or long waves up to a distance of 3,250 miles. For communication between the aeroplanes ultra-short-wave receiving and transmitting apparatus was installed.

The outfit for the members of the expedition was also chosen with the greatest care. Each aeroplane was equipped with silk tents for four, sleeping bags and rubber inflatable mattresses. Emergency equipment included inflatable rubber boats (clippers) with a carrying capacity of half a ton, collapsible sledges, snowshoes, an emergency portable wireless station, guns and ammunition. An important part of the cargo consisted of an emergency reserve supply of provisions chosen for high caloric value and light weight.

The clothing of the members of the expedition was light in weight but very warm. What did we wear? First of all warm woollens; over them in severe frost we wore woollen breeches and woollen jerseys. All members of the expedition wore warm sweaters, and leather or fur suits; when flying and in very low temperatures we also wrapped ourselves in very warm coats of fox fur. On our feet we wore woollen socks, stockings of dog fur, and reindeer-fur boots; in warm weather we used leather boots or waterproof Alpine climbing shoes. Our heads were covered with fur caps or fur Balaclava helmets and our hands with fur mittens. All this protected us both from extreme cold and from strong winds. As a general rule, severe cold in itself is not so terrible. Human beings can with comparative ease bear temperatures of 45 to 50° centigrade below zero. But the Arctic cold is usually coupled with strong winds, and then it is quite unbearable. Even the comparatively mild temperature of 20° below zero causes terrible torment if it is accompanied by a wind of 50 or 60 miles an hour. In Arctic exploration, therefore, the body must be protected not so much from the cold as from the wind. If the clothing is impermeable to the wind it will also be warm.

The scientific group, Papanin, Krenkel, Shirshov, and Feodorov made independent preparations. They ordered for themselves special equipment, special ultra-light-weight and yet ultra-reliable instruments and special supplies. As a result of eighteen months of preparation the station was magnificently equipped with all necessaries.

The centre of the Polar camp now drifting in the central part of the Arctic Ocean is the main living tent. Papanin went to a great deal of trouble to make it very warm, comfortable, and yet light in weight. The tent was made by the Moscow rubber factory "Kauchuk". The skeleton of the tent consists of aluminium tubes which are screwed

together and taken apart very easily; the walls are double canvas with two layers of eiderdown between them; the floor is of rubber and inflatable. The tent has a lean-to where wet footwear and guns may be left (the latter to protect them from condensation). In the tent there are beds, a small table and numerous pockets which take the place of trunks. The same factory made several silk tents for the expedition, to serve as laboratories, workshops, storerooms, etc. As a side-line "Kauchuk" also made waterproof trunks which are very light in weight and yet very capacious. One of these trunks, taking 40 kilograms (90 lbs.) of clothing, weighs only 400 grammes (about 1 lb.).

The wireless station cost Ernst Krenkel a great deal of worry. The apparatus in stock was not good enough for this fastidious wireless operator. He demanded a lightweight but very powerful station which could be picked up at very great distance. In the end two sets were made for Krenkel, a big one of 80 watts and an emergency one of 20 watts. It is all very light in weight, takes up very little room and is both ingenious and simple in construction. The main source of power for these sets are two alkaline accumulators loaded by a specially constructed wind motor or by the dynamo of a light petrol engine. In the last resource there is the possibility of hand cranking. The whole equipment from the aerial to the smallest spare part was made under Krenkel's personal supervision and with the direct participation of Nikolai Stromilov, one of the most gifted wireless experts and instructors in the Soviet Union, who later himself took part in the expedition. The constructors successfully kept within the weight limits set by their meticulous customers; the whole wireless equipment of the Polar station weighs only 500 kilograms (1,100 lbs.).

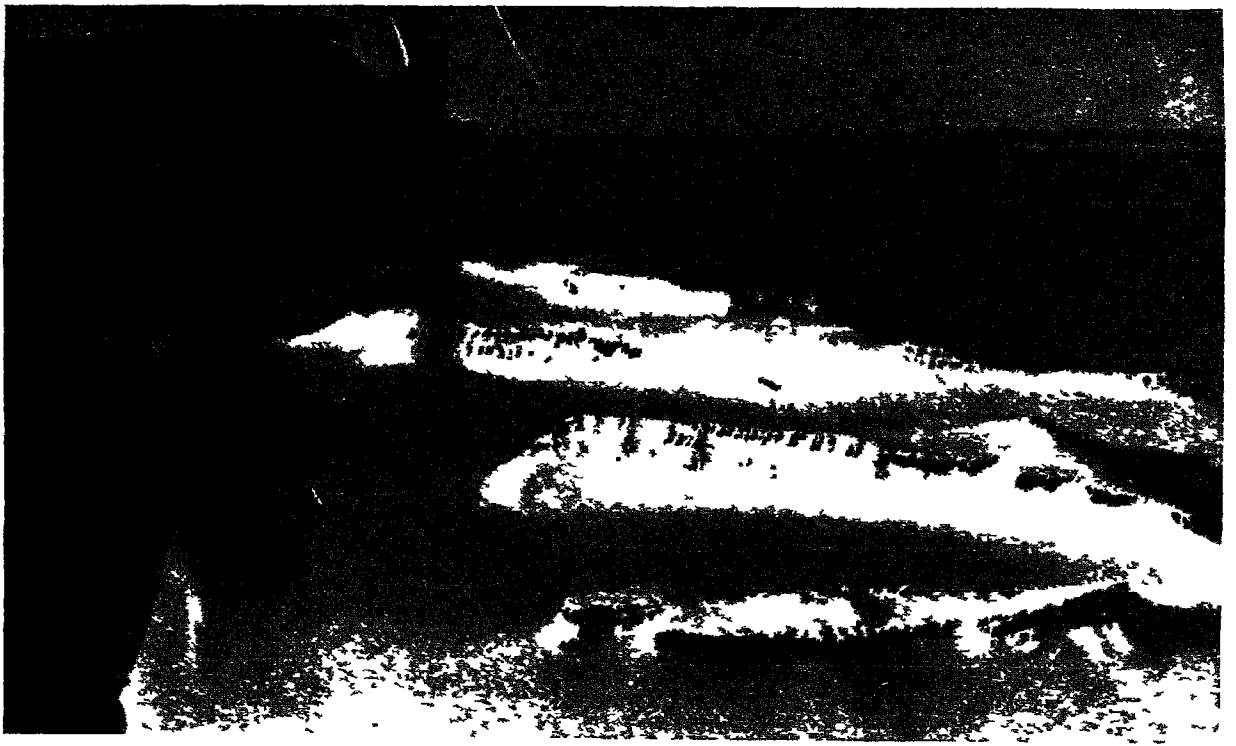
No less critical and meticulous was the choice of the scientific equipment for the station. Everything was made

specially to order. The usual apparatus for deep water soundings weighs about half a ton. The apparatus made for the expedition makes soundings possible to a depth of over 15,000 feet and yet weighs only 53 kilograms (117 lbs.). The so-called Nansen bathymeter proved too heavy and inconvenient, and was therefore reconstructed so that its weight was reduced to one-third without loss of either precision or reliability. The clumsy and heavy instrument for measuring the force of gravity was reduced to one-fourth of its usual weight and made more convenient to use. For the measurement of magnetic variations the Soviet scientists constructed new portable magnetic variometers. The meteorological instruments set up at the North Pole are all light-weight miniatures. Altogether the whole extensive and varied scientific equipment of the drifting station could be easily contained in one single room of any laboratory, and yet is sufficient to equip a whole scientific institute.

A great deal of thought was also given by the members of the expedition to the choice of all kinds of other equipment. In the event of a sudden pressure of the ice the station had to be in a position to move camp quickly from one place to another, and this involves sledges. There are very many types of sledges in the world, but after visiting the ethnographic museums and the collections of the Academy of Science of the U.S.S.R. and examining the sledges used by the various tribes of the Arctic Circle, the members of the party who were to winter on the ice were still unsatisfied. They wanted sledges which were easy to take apart and to assemble, which were extremely light and yet able to carry a load of half a ton. They therefore drafted a design of their own, and the Karakozov factory in Leningrad built special ash sledges to their drawings. These sledges weigh only 20 kilograms. No less attention was given to the paraffin cooking stoves, cooking pots, clothes and furniture.

The food used by the Polar expedition is also unusual and specific. Former expeditions to the Arctic used mainly canned goods, smoked sausage, pemmican and chocolate. The food was nourishing enough but it must be admitted that it was very tasteless and even nauseating. The monotonous diet very often caused scurvy and practically always roused the members of the expedition to curse the firms or organisations which had supplied it. Papanin found another solution. He approached the Institute of Public Nutrition and declared: "The party which was to winter on the ice must be fed as well as the guests in the best Moscow restaurants. Everything must be tasty, nourishing, varied and yet very light in weight." On Papanin's instructions the Institute provided the Polar station with food for eighteen months, the weight of the whole being slightly over 5 tons. They prepared concentrated beet, cabbage and other soups, Vienna chicken cutlets, etc. etc. All these concentrates are in briquettes of very small volume and weight. Thus, for example, a beet soup briquette about the size of a match-box will produce two soup plates full of hot soup. In all justice to the Institute it must be said that the quality of their product was excellent. When we made beet soup in Papanin's camp the North Pole was filled with the appetising odour of fresh cabbage, beetroot and meat. The culinary operations required by these concentrates are very simple; the briquettes are thrown into boiling water and in five minutes everything is ready. The Institute gave the expedition a ton of Vienna and chicken cutlets and 50 kilograms each of the various soups. In order to produce this quantity of concentrates 50 carcases of beef, 5,500 chickens and about 3 tons of vegetables had to be used.

All products were saturated with vitamins and in addition tablets of the anti-scurvy Vitamin C were packed in each can. The usual hard biscuits were replaced by white rusks



2 'PLANES OF THE EXPEDITION ABOVE FRANZ JOSEF LAND
View of one of the islands of the Archipelago from the air

made of milk, eggs and butter, and containing 35 per cent meat. All food was packed in air-tight metal boxes each containing food rations for twenty-five days. Each box contained forty different products. Had Papanin wished, he might have opened quite a good *delicatessen* shop at the North Pole. In addition to the products mentioned above and all sorts of condiments such as salt, pepper, mustard, bay leaves, vinegar, horse-radish, sauce, onions and garlic, he has fruit, chocolate, caviare, cheese, sausage, stewed fruit, jellies, cocoa, coffee, tea, egg-powder, milk-powder, bacon, ham and even pelmeni (a kind of miniature Cornish pasty). The only thing that is scarce is liquor. The group on the ice has a very small stock of high-grade brandy and nothing else.

But this was not the end of the preparations made by the members of the expedition. They also worked long and persistently to increase their own knowledge, greedily absorbing every new achievement of science and technique. But even this was not all. Only four men were going to stay at the North Pole. A sudden stroke of ill luck might incapacitate one or other of them. Calmly appreciating the position the comrades understudied each other's speciality. Papanin studied astronomy and meteorology, Shirshov and Feodorov specialised in subjects assigned to Papanin. Krenkel considered himself an expert in meteorology and Feodorov became quite a passable wireless operator. The party took no doctor to the Pole, and the duties of medical officer devolved on Shirshov. He attended clinics and hospitals in Leningrad for a whole year, acquiring surgical and therapeutical knowledge. To the horror of his companions Shirshov began to describe with great zest the pleasure felt by a surgeon at a successful amputation of a leg or an arm. The attendants at the dissecting theatres in Leningrad got to hate Shirshov thoroughly by the end of

the year—he had dissected more subjects than all the other medical students of his year taken together.

When everything was ready, the party that was to winter on the ice took their tent out into the open fields near Moscow, pitched it there on the snow far from the bustling town and lived in the tent for about a week. They wore their North Pole clothing, fed on concentrates and tested the functioning of the wireless apparatus. Sometimes they were visited by friends who cautiously tasted the strange food and sometimes were even daring enough to try on the fur suits. Everything proved to be solid and comfortable. At the end of the week Papanin arranged for a few unimportant alterations to the tent and declared that the group for the ice station was ready to start. The members of the air expedition were also ready to set out.

On February 13th, 1937, precisely one year after his first report to the Government, Professor Otto Schmidt was again invited to a conference at the Kremlin with Stalin, Molotov (chairman of the Council of People's Commissars), and People's Commissars Voroshilov, Orjonikidze, Kaganovich, Mikoyan, Chubar, and Yejov. Schmidt gave a detailed report of the work which had been done, outlined the tactics which would be pursued during operations, and gave a short description of the leading members, both of the aeroplane crews and of the party that was to winter on the ice. Those who had won the title of Heroes of the Soviet Union and other prominent Polar airmen were well known to the heads of the Soviet State. Stalin and Molotov spoke warmly of them, and especially of Molokov's calm tenacity, and they approved the choice of pilots. A warm, friendly smile greeted the mention of Ernst Krenkel. Papanin, head of the party that was to winter on the ice, was given a very flattering character by Chubar, who recalled his extraordinary cheerfulness under any circumstances.

Voroshilov agreed to allow Ivan Spirin, one of the best air navigating officers of the Soviet Air Force, to take part in the expedition. Then the Government also agreed that Professor Schmidt should himself accompany the expedition. Stalin approved all the preparations, and permission was given to the expedition to start in the second half of March. Stalin was the first to sign the draft decree dealing with the expedition, and then passed it on to the others.

Days of furious activity preceded the start. The airmen made their last practice flights; the mechanics nursed their machines day and night; and the navigators spent sleepless nights over their maps, graphs and calculations. Papanin, Krenkel, Shirshov and Feodorov hardly got out of their motor-cars, so busy were they looking after every detail of their varied equipment. It was during that period that the question of my own participation in the expedition was decided. The editorial office of *Pravda* sent me as a special correspondent. Otto Schmidt agreed and invited me to fly with him in the aeroplane USSR N–171.

The expedition's air squadron consisted of four four-engined aeroplanes and a two-engined scout 'plane. Otto Schmidt was appointed chief of the expedition with Mark Shevelev, chief of the Polar Aviation Department, as his deputy. Michael Vodopianov was the commander of the air squadron and Ivan Spirin chief navigating officer of the expedition.

The flagship of the expedition was the USSR N–170, piloted by Vodopianov. In addition to the pilot there were on board this 'plane Shevelev, Spirin, Michael Babushkin the second pilot, F. Bassein, K. Morozov, P. Pitenin (all mechanics,) E. Radominov, wireless engineer, I. Kistanov, instrument expert, B. Dzerdzeievski (these three were subsequently left at Rudolf Land, and did not take part in the flight to the Pole), and S. Ivanov, chief wireless officer.

The second aeroplane, the USSR N–171, was piloted by V. Molokov, and it carried Otto Schmidt (he was later transferred to the flagship), G. Orlov, second pilot, A. Ritsland, navigating officer, V. Ivashina and S. Frutetski (both mechanics), V. Gutovski, aviation engineer, Ernst Krenkel, wireless operator for the party wintering on the ice (he, too, like the others of the wintering party, later transferred to the flagship), and L. Brontman, special correspondent of *Pravda*.

The third aeroplane, USSR N–172, was flown by A. Alexeiev, with M. Kozlov as second pilot (he was transferred to the USSR N–169 at Rudolf Land), N. Jukov, navigating officer, K. Sugrobov, I. Schmandin and V. Ginkin (mechanics), Ivan Papanin, chief of the party wintering at the Pole, Peter Shirshov and Eugene Feodorov, members of the wintering party, and M. Troianovski, cinematograph operator (these four transferred to the flagship for the flight from Rudolf Land to the Pole).

The fourth aeroplane, USSR N–169, was commanded by I. Mazuruk; Captain J. Moshkovski was second pilot (at Rudolf Land he was transferred to the USSR N–172). Further, this aeroplane carried V. Akkuratov, navigating officer, D. Shekurov, D. Timofeievich and J. Brezin (mechanics) (at Rudolf Land Brezin was transferred to the N–128), A. Dogmarov, Party organiser attached to the expedition, and E. Vilenski, special correspondent of *Isvestia* (he made the flight to the Pole in the N–172). L. Kruze, the pilot, who at Rudolf Land was appointed commander of the scout 'plane USSR N–128, was also on this machine.

The twin-engined scout 'plane of the expedition, the USSR N–166, was piloted by P. Golovin and in addition to him carried Lieutenant A. Volkov, navigating officer, N. Kekushev, and V. Terentiev (mechanics), and N. Stromilov, wireless operator.

II

THE START

THE SQUADRON WAS in the air at last! The first to take off was Vodopianov, and soon the other machines were also up. It was March 22nd, and already warm.

Majestically the squadron made the traditional circle over the aerodrome. On the snow-covered ground the tiny figures of those who had come to say good-bye, the black boxes that were cars and the apparently flat rectangles of the hangars showed up in clear-cut outline. Along the Leningrad Road stretched the familiar buildings of the Air Academy, the factories and the Pravda Printing Works. The tiny houses seemed all the same size, and the great blocks looked like the cardboard models of an architectural studio.

After completing the farewell circle, the aeroplanes formed into line and set off on their course. Vodopianov's flagship led, with Molokov on his left, Mazuruk on his right, and Alexeiev bringing up the rear. This previously determined formation was maintained up to the moment of landing. Mazuruk was the most conscientious in observing it. He stuck close to the leading machine, leaving a distance of only 100 to 150 yards between it and his own 'plane, and accurately following every manœuvre of the flagship.

Mazuruk, who had acted as instructor for a long time, had an irreproachable flying technique. This, coupled with exceptional experience, a fine intuition and a profound knowledge of the material side of his profession enabled him to advance rapidly into the ranks of our first-grade

pilots. He was deservedly regarded as the best pilot of the Far Eastern air services, and his appointment to the North Pole expedition was accepted by everyone as a correct choice.

The weather was dull. There were low-lying clouds with a strong gusty wind, and visibility was poor. But we could not wait for better meteorological conditions. The spring was coming up from the South and the aerodrome was thawing visibly, and it was imperative to move North at all costs. This was by no means easy. At first the squadron flew at a height of 900 to 1,200 feet. But the clouds sank lower and lower, gradually forcing the machines down towards the earth. We went down to 600 feet, then lower still, and beyond Niandoma our machines were almost grazing the ground. The altimeters showed 120 feet minus —we were in a deep hollow.

The first stage of the flight was a remarkable all-round test for our equipment. The aeroplanes were subjected to every possible atmospheric unpleasantness with the exception of an Arctic blizzard and a tornado. They cut through ragged clouds, passed through falling snow and a veil of light fog. Halfway to our destination the pilots noticed with some alarm the first signs of ice deposit: the windows of the pilot's cabin were getting covered with a thin film of transparent ice, and the front edges of the wings began to glisten. Fortunately the danger zone proved to be narrow and the alarming symptoms soon vanished. The sharp gusty wind and low-lying clouds caused the pitching which is inevitable in such conditions. In fact we were thrown about a great deal. The airway became like a rough road, with all sorts of hollows, bumps and ridges, and the heavily laden aeroplanes rolled like ships in heavy weather. Even some of the off-duty pilots and mechanics, seasoned as they were to all the vagaries of the air, paid their tribute to nature. As for us landlubbers—the less said the better. . . .

The chief navigating officer of the expedition shaped a straight course for Archangel. It is difficult to understand by what landmarks our navigator steered his ship. Below stretched an endless uniform waste of snow dotted in spots with a bristle of forest. Villages were few and far between and as like each other as two peas. But after landing we checked up on our course and found that Spirin had navigated the 'plane to a hair—the ships had flown from Moscow to Archangel as straight as an arrow.

Life on board was well regulated and orderly. Each man had his own work to do. The pilots flew the 'planes; the navigators set the course and from time to time communicated with the flagship; the mechanics eagerly pursued their deafening activities. These hard-working fellows are always busy both on the earth and in the air. During the flight Molokov noticed that the horizontal rudder was not working smoothly. He summoned Ivashina, one of the mechanics, and asked him to see about it. Ivashina ran along the fuselage and looked out of the stern porthole. The pitching here was unbearable. According to Ivashina, the aeroplane "wriggled like a snake". He was not tall enough to see what was wrong. A fierce wind lashed his face unmercifully. Fearing that the wind might blow him out of the aeroplane, Ivashina asked Gutovski to hold him by the legs, then leant over and in this position examined the whole tail of the machine. He found that the trusses were slack. Crawling back into the ship the mechanic tightened them up, and the aeroplane went on without further trouble.

As we approached Archangel the weather brightened. The blanket of clouds lifted and the machines flew at an altitude of 1,500 feet. The engines worked beautifully. Their uniform purr never changed a note. On the way Vodopianov and Mazuruk tested the automatic pilots

installed in their 'planes. The automatic pilots flew the aeroplanes obediently and meticulously on the prescribed course, exactly observing the direction, speed and height indicated. After a test of two hours the flesh-and-blood pilots again took over from their mechanised assistants, paying tribute to the accurate discharge of their duties by the latter.

Spring was coming even in the North. The Archangel aerodrome was thawing and could not take our super-heavy aeroplanes. Therefore an emergency aerodrome was prepared for our landing about fifty miles from Archangel, near the village of Kholmogori, the birthplace of Michael Lomonosov, the great Russian writer and scientist of the eighteenth century. Turning sharply, our machines described a circle over the aerodrome as a greeting and proceeded to land. The huge wheels of the undercarriages ploughed deep furrows in the snow and then came to a stop. A few minutes later we were surrounded by an excited crowd of collective farmers who had rushed to the aerodrome from all parts of the district.

The first stage of the flight was completed. In five hours our machines had travelled nearly 670 miles. But there were about 2,000 more to come.

The "Big Land", as Polar explorers usually call the continent, was in fact left behind when we left Archangel. From there we could still ring up Moscow and ask for more instruments, spare parts, or any forgotten item of equipment. But after leaving Archangel the expedition could count only on its own resources.

This was why the personnel tested so carefully all preparations for the continuation of the flight. The days spent near Archangel were taken up with arranging material, rapid and matter-of-fact conferences and detailed technical

preparations. First of all runners were substituted for wheels on all the aeroplanes. The giant flying-boats of the expedition were overhauled down to the last little screw. The indefatigable mechanics and engineers were ceaselessly occupied with improving their arrangements, effecting changes for the better noticeable only to themselves, turning upside down and then putting in order again the entire movable and fixed equipment of the machines. The officers in command of the aeroplanes spent practically all their time on the flying-field, deciding on the spot all the innumerable problems which inevitably arose during the work of preparing the machines for the second start. The navigating officers meticulously examined the navigating instruments, and in the evenings exchanged notes and discussed alternative routes.

This apparently simple job proved to be by no means easy. Everything had to be taken into account: the weather, the direction of the wind, the probability of ice condensation in one or other region. To crown it all, the existing charts proved to be inexact and contradictory. There are very few landmarks in the North and therefore navigating officers tend to rely on them more than usual. But here there was nothing at all to rely on. On one map a river flowing into Lake Poldo did so from a Northern direction, and on another map from the South-West; the same villages bore different names on different maps, and the courses of rivers were shown in opposite ways.

Life was full of cares and worries. The aerodrome where the aeroplanes stood was nearly fifty miles from Archangel. The pilots lived in the rest home of the District Executive Committee near the village of Liavlia, nearly eighteen miles from the town. Every morning they drove to the aerodrome and did not return until the evening. Traffic flowed along the road unceasingly: cars with passengers,

lorries with spare parts, convoys of trucks bringing the runners for the aeroplanes.

All this time spring was coming closer, leaving us in no doubt about it. Every morning Professor Schmidt anxiously enquired about the temperature, and bit his beard in annoyance at the answer. It was warm, the roads were soaking, the thickness of the snow covering was decreasing visibly. Dzerdzeievski, the weather expert of the expedition, kept an eye open for all cyclones and anti-cyclones coming up at any point of the earth, but saw no ray of light piercing the atmospheric gloom. We all, including Golovin, our long-distance scout, sat waiting for a frost. Bad news was coming in from all sides. In Archangel the aerodrome had thawed to such an extent that an aeroplane had sunk right into it, the ice on the Dvina had grown so fragile that the authorities had issued a ban on motor-car traffic on the ice and in Narian-Mar the thermometer was registering temperatures above zero.

It was only in the evenings, when we were all together, that our spirits rose somewhat. Our group was cheerful, alert and energetic enough. Heated debates about atmospheric troubles often ended in the spinning of yarns—and fine yarns these Polar explorers and airmen could spin!

In order to test the wireless apparatus, Golovin made a trial flight. The machine laboured heavily on the soft wet snow. The mechanics Kekushev and Terentiev left their places to push the machine from behind. The lightened 'plane ran faster, the mechanics stumbled in the snow and could not catch up, and Golovin flew away without his crew. In connection with this Mazuruk told us of a similar incident. He was flying a hydroplane with passengers. When he reached his destination he came down on the water and began to manœuvre the 'plane to the landing-stage. Suddenly the machine stranded on a shoal. The

passengers were women and could hardly be asked to get out into the water. The pilot had to leave the cabin, wade in and push the machine off the sandbank. The machine suddenly rolled forward, took the water and quickly moved out to sea. Mazuruk rushed after the 'plane, then began to swim, but the distance between them grew steadily greater. The passengers were terrified, when fortunately a wave turned the machine round and it floated back towards the pilot, who had almost given up the chase in despair.

Then Captain Moshkovski amused his listeners with stories of parachute stunts. Philosophically-minded Alexeiev was interested in homeopathy and Tibetan medicine, while taciturn Molokov listened attentively to all and smoked his eternal pipe.

But such peaceful anecdotes were often broken into by some urgent problem, and improvised councils were held there and then at the dinner-table or breakfast-table and decisions taken. The yarn-spinners, hastily drinking up their cup of tea, would speed away along the bumpy road to Kholmogori or Archangel.

So the days passed. Every morning the chief of the expedition looked inquiringly at Dzerdzeievski, with the mute question:

"What's the weather like on the route?" And Dzerdzeievski answered each time:

"I don't advise a start."

At last on March 29th there were signs of a certain improvement in the unfavourable meteorological conditions. At dawn all the crews met at the aerodrome. A light frost had closed up the innumerable pools, and the pilots gave a sigh of relief: at last it was possible to get away! But weather in the North is treacherous. Hardly had the mechanics started up the engines when the light grey sky suddenly turned the colour of dirty wool. The training

aeroplane U–2 which had gone up to reconnoitre was lost in a blanket of cloud at a height of only 600 feet. Then came a fall of wet, sticky snow; the flying-field was awash, and water splashed about everywhere. There could be no question of a start. The crews, gloomy and taciturn, returned to their quarters. In the evening a fierce South wind blew away the vault of clouds, and tugged savagely at the machines, threatening to overturn them. The mechanics ran to their machines and did not come back until heavy anchors of ropes and petrol barrels were holding the ships securely to the ground.

Next morning again found us all at the aerodrome. The meteorological reports predicted changeable but tolerable weather. It was decided to wait a little while and take off between 9 and 10 a.m. The mechanics made every preparation for the start. The four mighty aeroplanes stood on the field in readiness for flight. Two days previously wheels had been fitted to each machine in case a forced landing might have to be effected at Narian-Mar. The fuel tanks were filled and the equipment of the party that was to winter on the ice distributed evenly among the 'planes. The pilots in charge of the aeroplanes from time to time attempted to cut down Papanin's cargo, but the chief of the future station at the Pole went on loading his cargo and parried all threats with one stereotyped phrase:

"But, my dear fellow, this really weighs next to nothing. I myself weigh ten times as much!"

The time for the take-off came at last. And at that moment it was found that the right inner engine of the N–171 would not start. Ivashina, Frutetski and Gutovski, the mechanics attached to this machine, strained every muscle but the propeller would not budge. A general council of all the mechanics of the expedition met in front of the unlucky machine. Good advice was plentiful, but the



3 CELEBRATION OF MAY 1ST, AT RUDOLF LAND
The salute

engine would not crank: it was cold. Suddenly there was a loud shout: "Make way there!" and the mechanics of the N–169 arrived carrying on their shoulders some of the sacrosanct emergency reserves of the flight: a flask of compressed air. Mazuruk, the commander of the N–169, had unselfishly sacrificed this treasure for the crew of the companion machine. True, he knew that if Molokov could not start, neither could he, but nevertheless it was an unselfish act. The compressed air did the trick and the engine burst into life. A tractor pressing down the snow came up in front of the aeroplanes, and dragged each of them in turn from its place. This freed their runners, which had been frozen to the ground, and the 'planes taxied up to take off.

Such a start required great skill on the part of the pilot. There was water everywhere under the thin covering of snow. The wet snow hampered the movement even of light machines. The task was rendered even more difficult by the fact that the machines had to lift a tremendous load. The flying weight of each machine was 22.5 tons. The wind was blowing across the runway, and the slightest mistake threatened disaster. The skill of the pilots and the mighty strength of the engines solved the intricate task. Golovin, who took off two days previously and whose machine was far lighter and easier to manage than the gigantic aeroplanes of the expedition, had to taxi almost from one end of the flying-field to the other. But contrary to all expectations the start of the heavy machines did not prove so very difficult.

Mazuruk was the first to take off. He left the ground after a run of about 900 yards. The next was Vodopianov, followed by Molokov, Alexeiev bringing up the rear. This pilot, who had devoted half his flying life to the Arctic and to work in the Far North, decided to use the take-off

to clear up a number of technical points connected with further operations. He wanted to know what was the maximum length of run of the machine, its capacity to rise at certain lower engine revolutions, and many other points. The range of his interests was always very broad: he was interested in everything from the Sanskrit language to ultra-short-wave wireless. A man of brilliant educational attainments and a skilled and exacting airman, all through his life he has striven to find something new, unusual and productive out of the experience of each flight.

After describing a few wide circles over Kholmogori the squadron proceeded on its course, which lay across the tundra (the boggy, moss-covered plains of Northern Europe and Asia) to Narian-Mar. It was pleasant flying: the warm sun caressed the plain and made it look attractive and inviting from above. But an hour later the sun was hidden by clouds, and at once the plain lost all its loveliness. It now looked deserted, empty and monotonous in the extreme: a boundless expanse of snow darkened by rare patches of forest—but these became even rarer as we proceeded on our way. As far as our eyes could see stretched the dreary, dead tundra, with here and there a winding, snow-covered river as yet untraced on any map.

Our motors hummed steadily and monotonously. Exhausted by their efforts at the start, our mechanics Ivashina and Gutovski were annihilating cold pork and cheese cakes with a healthy zest. They were sitting contentedly in front of their instrument-boards, from time to time turning a tap or moving a lever. Our machines flew in a group at a height of between 1,200 and 1,500 feet, with a strong South-Westerly wind speeding the armada on its way. After two hours a dark shroud showed on our port side. Our pilots stared in amazement at it. Fog? If so, why had it such clearly defined limits? We came nearer.

"It's the sea," Molokov observed, with a shrug of his shoulders.

Two more minutes, and we were flying over Cheshskaya Bay. Our chief navigating officer, Spirin, had brought us here in order to avoid a snow-storm. A strange feeling came over me. Below us stretched a whole ocean of open water, reaching out towards the horizon; only in the distance, at some point where earth met sky, could a few patches of ice-field be seen. But straight below us was dark water, thinly strewn in some places with a confetti of ice fragments. Where could we land here? Then I listened to the even rhythm of our mighty engines, I looked at Molokov's calm, smiling face, and at once began to feel as if I too were more than an ordinary mortal.

Throughout the Soviet Union Molokov's name has become a symbol of reliability, confidence and brilliant skill. He is really loved as a hero of the Soviet people, and he carries this distinction with charming modesty. He has flown everywhere. The routes of his flights criss-cross the whole vast territory of the Soviet Union and form a close mesh net in the Arctic. In 1934 this quiet, unassuming man with the clear blue eyes was sent out to rescue the crew of the *Cheliuskin*. Piloting a small machine, Molokov reached the ice-bound camp in the distant and sinister Chukotsk Sea, and plied like a taxi between the camp and the village of Vankar, carrying the *Cheliuskin* crew to safety. He made nine trips to the camp and saved thirty-nine persons; he conceived the brilliant idea of carrying his passengers not only in the cabin of the aeroplane but in the parachute chests under the wings which are generally used for light cargo. For this exploit the title of "Hero of the Soviet Union" was conferred on him. Immediately afterwards he made another important and difficult flight to the Arctic. On his return, without as it

were folding his wings, he again set out with his aeroplane to explore the Soviet North from its Western to its Eastern boundaries. For his excellent work the Government awarded him the Order of Lenin and the Order of the Red Flag, and the workers elected him to sit on the Central Executive Committee of the U.S.S.R.

Beyond Cheshskaya Bay we met low-lying clouds. Puffs of smoke, as if from some gigantic cigarette, floated past us. The earth was hidden. The aeroplanes began to roll. Below us, as before, stretched the tundra. We could see no human settlements—only once or twice we caught sight of the isolated huts of trappers. That was all. Then we saw one larger settlement, Nizhnaya Pesha, consisting of several dozen buildings. Incidentally the size of this settlement satisfied our Polar experts; it indicated a sufficient density of population for Arctic conditions.

During our flight the flagship kept in constant touch with the ground. Ivanov, the wireless officer, was in contact with Archangel, Narian-Mar and even with the wireless station of the Northern Sea Route Commission in Moscow. Soon after we had passed Cheshskaya Bay Ivanov received a weather report from Narian-Mar and passed it on to the chief navigating officer, who glanced at it and hurriedly stuffed it into his pocket. The report said that a snowstorm was raging at Narian-Mar, and that visibility did not extend beyond a few yards. What were we to do? Turn back?

We flew on.

An hour later a second wireless message informed us that the snowstorm was over, and when we arrived at Narian-Mar the weather was fine, the clouds were high, and visibility was excellent. After circling over the town our aeroplanes landed on the fine aerodrome laid out on the Pechora river. The flight from Kholmogori to Narian-

Mar took two hours and fifty minutes, giving an average speed of 160 miles an hour.

We were given an exceptionally warm welcome. All the leading personalities of the Nenets national district, the population of the town itself and all the special correspondents of Moscow newspapers came out to the aerodrome. At Narian-Mar itself the crews were received with the warmest hospitality. We were given comfortable billets and plenty of excellent food, and surrounded with every possible attention and kindness.

Probably none of the members of the expedition had imagined in Moscow how great the difficulties would actually be. True, the general scheme was clear from the very beginning; the main stages had been defined correctly and with careful deliberation. But the very first stages of the flight already made necessary considerable and important changes in the general plan, and compelled us to consider carefully and in detail every trifle and every individual occurrence. Thus for instance something went wrong with the wireless transmitter on Golovin's aeroplane and the pilot had to wait at Narian-Mar for over a week because his wireless did not work—in these latitudes it is impossible to fly without means of communication. Therefore the mechanics, pilots, and wireless operators of the squadron spent all their time at the aerodrome at both Kholmogori and Narian-Mar, putting right the slightest defects in the equipment and studying all the ingenious details of the vast and intricate apparatus.

"What a lot of taps, levers and switches!" Ivashina, our most experienced and praiseworthy mechanic, said with a sigh.

It was quite true that there were a devil of a lot of little taps all over the aeroplane. The total length of the pipes supplying the engines with water, oil and petrol is probably

several hundred yards. All along this length there are safety cocks, regulating valves and exhaust valves, communicating switches. And on each of them depends the rhythm and effect of the engine's performance.

There was work enough for all. The wireless operators listened to their receiving and transmitting sets with the attentive ear of doctors listening to a patient's heart-beats. They argued heatedly and passionately about the origin of atmospherics, compared the advantages and defects of various layouts and went into the details of arrangements within the machines themselves. The navigating officers tested and retested their navigating instruments, which crowded the cabin to such an extent that it looked like an instrument dealer's shop. Not to mention the mechanics, who literally dug themselves into their engines, trying out various improvements made for the flight to the North and putting right various defects which had become apparent during the first stages of the flight.

At the same time, cardinal problems of tactics faced the expedition. Sometimes these problems were of a technical form. Should they take wheels with them as spares or fly with runners alone? At first sight this appears a purely technical question. But in actual fact it would decide the entire line of action. Wheels would increase the weight of an aeroplane by about 1,800 lbs., would increase air resistance and decrease speed. To take wheels would mean that one more intermediate landing would have to be made. It is also no easy matter to take off and land an overloaded machine.

"In the conditions facing our expedition, the difficulty of the flight lies mainly in the take-off. Figuratively speaking, we are paid only for taking off," Alexeiev explained to the other members of the expedition.

Swords were crossed again and again over these ill-starred wheels. To take or not to take? Landing with a wheeled

undercarriage was much easier and made landing possible even on surfaces on which runners might be damaged (as, for example, with projecting rock). But on the other hand the landing at the Pole might have to be made on an ice-field furrowed by cracks or pitted with holes, and in this case runners would be much better. Besides, carrying wheels meant 1,800 lbs. of additional weight, when the machines were overloaded as it was. So it was decided to leave the wheels behind.

No less important was the choice of the further route. The flight from Narian-Mar to Rudolf Land was a most complicated business. The distance as the crow flies was a thousand miles. There were two alternatives: the first to make an intermediate landing at Amderma and from there fly on to Rudolf Land. In this case we would have to fly over the famous Matochkin Strait—which enjoys a dismal reputation for its downward-bearing air currents—and cross Cape Jelaniya, the "Pole of Winds" as it is called by Polar airmen. The advantages of this route were that it included fewer stretches of open sea. The second alternative was to fly straight from Narian-Mar to Rudolf Land. By far the greater part of this route lay over the Barents Sea. At this time of year the South-Eastern part of the Barents Sea is almost free of ice. Our machines were landplanes: a landing on the water would be impossible. In the event of engine failure on any machine the crew would have little hope. But the advantage of this route lay in the more favourable wind conditions and in the avoidance of an intermediate landing.

There is no need to hide the fact that the decision was not easy to make. The leaders of the expedition and the whole crew were well aware of the difficulties and dangers of both routes. A conference of the officers in command of the aeroplanes decided in favour of the second route:

from Narian-Mar straight to Rudolf Land by way of the Barents Sea. On Schmidt's suggestion the course to be followed was fixed closer to the Western coast of Novaya Zemlya, so that any aeroplane developing trouble in one engine might yet reach the coast. This considerably lessened the risk of a flight across the open sea. True, the mountains of Novaya Zemlya were not very suitable for a landing, but in any case here the crew had a chance even if the machine was smashed. Soberly weighing the serious conditions under which the squadron had to fly, the commanders of the 'planes agreed on rules for flying in fog, for machines that might lag behind, and for wireless communication in case any aeroplane met with disaster.

It is a pleasure to note that none of the members of the expedition had any hesitation in facing this extremely difficult and dangerous stage of the journey. The men had faith in the excellence of their aeroplanes and engines, in the skill of the pilots and in themselves. This confidence found clear and precise expression at the Party meeting and at the first general meeting of the members of the expedition, held in Narian-Mar. Here the deficiencies which had become apparent during the first stages of the flight were severely criticised, methods of mutual technical assistance were agreed upon, a scheme of further work drawn up and the bonds of friendship between the crews of the various ships knitted closer. The concluding speech at the general meeting was made by Otto Schmidt. He said:

"At the Kremlin banquet given in honour of the men of the *Cheliuskin* and the seven Heroes of the Soviet Union, Comrade Stalin made a speech. He said that the Heroes of the Soviet Union had shown that 'madness of the brave' of which poets sing. But bravery alone is not enough. To bravery must be added organisation—the organised

effort which the men of the *Cheliuskin* showed on the ice-floe. A combination of bravery and organisation will make us invincible. We must always remember these words of Comrade Stalin. Organisation will decide the success of our expedition. Our flight is not merely a useful and necessary thing. What is at stake is to some extent the honour of our country. And the honour of our country will be upheld by us to the last!"

These words of the leader of the expedition expressed the thoughts and feelings of the whole group. Forty-five men took part in the Polar expedition. They were distributed among five aeroplanes, constituting five separate crews striving together towards the same goal. But all the sections were united in a single joint army, small enough but strong and solid.

A strong, firm, unanimous collective group! Its composition was varied enough. It included meritorious and experienced Polar experts such as Molokov, Vodopianov, Shevelev, Alexeiev, Babushkin, Golovin, Bassein, Ivashina and Sugrobov, and men now visiting the Arctic for the first time in their lives: Mazuruk, Spirin, Shekurov, Ginkin, Moshkovski. But all, from Schmidt, leader of the expedition, downwards, had had much experience; they were all determined to achieve their objective, all fully conscious of the responsibilities laid on their shoulders by their country, and all were filled with the desire to justify the confidence placed in them by the Party and the Government.

Polar airmen are accustomed to fly alone, relying only on themselves and their crew. So at first there was a certain lack of cohesion among the various crews. This did not influence their mutual relations, which were always hearty and imbued with the spirit of true comradeship. But there was not yet the necessary harmony which decides the success of any venture. Slowly but surely this feeling of

unity grew. The dividing lines between the crews disappeared. Each man loved his own 'plane as before but men already began to care equally about the other 'planes. Consciousness of the interdependent character of their venture gradually soaked into their bones. All of them were well aware of the difficulties of the coming flight. The risk incurred in flying over the open sea in land aeroplanes was considerable. Without glossing over difficulties, the group collectively did its best to reduce the risk, and each man felt responsible to all the others.

On April 2nd all preparations for the flight were concluded. The next day was made a holiday, a day of rest before the start. But from the early morning the rooms in the school and reindeer State farm which were the quarters of the members of the expedition were empty. All hands had left for the aerodrome. The aeroplanes were examined over and over again to check up on their preparedness to make the flight. It was only in the late evening that the crews returned to their quarters.

Special and honourable mention must be made here of the members of the group that was to winter at the Pole: Papanin and his friends. During the last days of their stay in Moscow they had been up to the eyes in work. Their day began and ended in the small hours. They had to get more scientific instruments, settle accounts with innumerable supplying firms, and put their personal affairs in order. The latter were a worry to Shirshov and Feodorov in particular: they both expected an addition to their families in May or June, and naturally enough they were rather uneasy before the start. From the North Pole they could not give any assistance to their wives and therefore made every effort to secure for them the care and attention of friends.

On the eve of the start it was obvious that the overloaded aeroplanes would not be able to take off from the

thawing Moscow aerodrome. The leaders decided to send the entire cargo to Archangel by rail. All night Papanin and his friends, trusting no one else to do the work, were busy loading the stuff into the truck, or rather, not loading, but carefully placing every box and bundle, in order that the precious apparatus and equipment might not be damaged. They started on the flight in a state of complete exhaustion. On the way to Archangel they, like all the rest of us, were thoroughly shaken up, but hardly had the wheels of the undercarriage touched ground when the whole quartet rushed away to town to find out where their truck was. They arranged for motors to carry their property from the railway station to the aerodrome, and only then did they take a rest. The next day the truck arrived. Not allowing anyone to come near, Papanin, Krenkel, Shirshov and Feodorov themselves carried all the stuff to the platform and into the lorries; then they climbed in on top, and holding the chronometers in their arms to protect them from jolts, they drove off to Kholmogori. Here again they themselves stowed away all their equipment in the aeroplanes, first inquiring from the pilots which were the most stable places in the vast available space of the ship. The instruments and other breakables were placed in the centre of the fuselage, the skis in the wings and the tents in the tail.

Finally everything was ready. But Papanin and his group would not leave the aerodrome. The commanders of the aeroplanes began to look askance at these fellows in leather jackets. The machines were overloaded to the rim, but the irrepressible Papanin was still bringing up more and more things. He had a special passion for foodstuffs. Well aware of the value that each kilogram of food would have for those wintering at the North Pole, the pilots looked the other way when whole cheeses, barrels of cream and

other things suddenly appeared in the cabins. One day Papanin went up to Chief Navigating Officer Spirin and with a disingenuous air asked him what he thought of pig-breeding. Spirin replied with a surprised air that up to the present pigs were not used in air-navigation.

"That is not what I mean," Papanin said gently. "I should like to take a small live pig to the North Pole, feed it there on scraps and then kill it during the Polar night."

The chief navigating officer stood aghast:

"A small pig? But it will squeal, run about the aeroplane and disturb our equilibrium!"

"Nothing of the kind; my good fellow, it's quite small," Papanin answered quickly, and vanished.

Two hours later a sledge brought a boar weighing two hundred pounds alongside the aeroplane. A slightly embarrassed Papanin walked beside the sledge.

"Get out!" roared the navigating officer. "You or the pig—the machine can't possibly lift you both!"

The "small pig" was returned to its sty.

At Narian-Mar, before starting on the most difficult stage, the flight over the sea, a few days were spent in carefully preparing the aeroplanes. "Papanin's Four", as they were nicknamed by the members of the expedition, took an active part in all the work. Shirshov and Feodorov drove to the forest to cut fir branches, and then helped the crew to jack up the aeroplanes, free the runners and put twigs under them in order to prevent their freezing fast on the ground of the aerodrome. When Golovin's wireless went wrong, Krenkel spent forty-eight hours on the aeroplane helping the wireless men in locating the trouble and putting it right. They were an energetic, cheerful collective group. Whenever Papanin and his mates turned up, soon there were roars of laughter, merry shouts and a hail of jokes. The whole expedition took up



4

AT RUDOLF LAND

Papanin selects a dog, the fifth member of the party to winter on the ice

the phrase coined by Papanin when he first saw the pilot Mazuruk in his fur outfit:

"I say, are you thinking of going to the North Pole?"

In the evenings they worked persistently and diligently, "picking up loose ends". Papanin and Feodorov plotted all sorts of graphs which would facilitate their calculations at the Pole; Shirshov studied the tables of correctives to the instrument readings, and Krenkel memorised the call ciphers of all the wireless stations of the earth. Their immersion in their work was frequently interrupted by a general burst of laughter; then they would exchange a few jocular remarks and again bend over their desks. Having finished a chart showing the position of celestial bodies in April, Feodorov undertook to verify the chronometers. Finally he examined the watches of all members of the group that was to winter at the Pole, and checked their accuracy daily by wireless.

"In case the chronometers get lost overboard the watches will have to serve as a substitute," he explained to an astonished audience.

They tried to rest as much as possible. They played chess. Krenkel won most of the games and Shirshov took to calling him the chess champion of the North Pole. We read little, having brought practically no books in order to avoid excess weight in the already overloaded machines. On hearing that Krenkel could recite by heart almost the whole of Pushkin's poem "Eugene Onegin" Papanin was frightfully pleased, and sonorously conferred upon Krenkel the title of "library":

"No extra weight, yet we have Pushkin!"

Thus passed the last few days of our stay on the mainland. They were full of work, fun and laughter. These men, on their way to a dangerous winter camp on a drifting ice-floe at the North Pole, were a mixture of the calm

courage of Jack London heroes, the concentrated experience of Soviet Polar scientists and the Bolshevik determination to win through.

One evening we were with Papanin in the porch of our quarters. A calm, windless night was beginning. A wonderful star-lit heaven lay over Narian-Mar. Streaks of pellucid matter, flaring up and dying down, trailed across the sky, as if a gigantic brush were smearing the starry dome with silver paint. It was the beginning of the Northern Lights. We smoked in silence.

"What magnificent Northern Lights we shall see on the top of the world!" Papanin said thoughtfully. "I should like to be home at last, at the Pole!"

The colour on the horizon slowly disappeared. Reindeer teams galloped past the house.

III

COURSE—NORTH

OUR STAY AT Narian-Mar was perforce lengthened by wretched weather. The aeroplanes were drawn up on the wide expanse of the mighty Pechora; the spring rime on them gleamed faintly. Spring was hard on our heels. It had driven the whole squadron from Moscow, and raced after us northwards. We had just barely succeeded in escaping from the thaw at Kholmogori, and here again we felt the potent breath of warmth and moist air and the sun though caressing did not fill our hearts with joy. The aerodrome was crumbling away before our eyes; the snow was growing moist, sticky and spongy. The weather was changing every day; low, murky clouds hung over the runway.

All the aeroplanes had long been ready to start for Rudolf Land. Every day we would bid farewell to the mainland, and go out hopefully to the river bank—only to return full of gloom to the town. We felt as if even the hospitable people of that distant Arctic town were beginning to treat us with something like contempt, as if censuring us for our helplessness in face of the cyclones and meteorological obstacles that lay in profusion along our further course.

On the evening of April 10th the traditional meeting of commanders was held at Schmidt's quarters. Dzerdzeievski —the Perun of the expedition—in a few words informed those assembled what lay ahead of us. There was a forty-mile-an-hour wind disporting itself round Cape Jelaniya,

a moderate gale in Pacific Bay, and icy sleet at Rudolf Land. A cyclone was coming up from the West, bringing low clouds that might cover Narian-Mar.

"In comparison with what we had earlier," Schmidt observed, "the weather's not bad. What do the commanders think?"

For a while there was silence; then it was broken by Vodopianov.

"I think we ought to fly," he said. "The main thing for us is to get past Novaya Zemlya. This weather's better in the open sea. Last year I had the chance to observe a number of strange things about the archipelago: when there's a fog at sea, the mountains are clear; when the sea's clear, the mountains are hidden. It's as if there's some factory there working three shifts to produce bad weather. We must seize the moment and fly."

"Could we return if we found the Franz Josef archipelago covered with cloud?" Golovin asked.

"No," Dzerdzeievski answered. "Then Narian-Mar would also be covered."

The decision was that we should all get up at two in the morning; that at five o'clock our long-distance scout, Golovin, should take off, and at six the whole squadron should set out after him.

While it was still quite dark the aerodrome was already buzzing with activity. When dawn came the mechanics warmed up the engines and got everything ready for the start. Golovin walked up to Schmidt and announced that he was ready.

"Well, then, take off!" Schmidt said. "Report the weather you meet, and if it's all right we'll follow you."

Golovin's orange-coloured 'plane tore off across the river. It seemed to taxi along for ever, but at last it took

the air. And soon the pilot disappeared in the misty distance to the North.

An hour passed.

"To the 'planes!" Vodopianov's order rang out. Everyone went to his place. The chief's machine ran heavily along the ice and rose into the air. It circled low over the aerodrome, waiting for the others to take off. Molokov next brought his machine over to the starting point. But hardly had he turned on to the runway when the starter began waving his flag. Molokov pulled up, leaned out of the upper porthole and asked sharply:

"What's the matter?"

"Golovin is coming back," the starter answered.

"What are we to do?" Molokov asked Schmidt, who was sitting by him.

"We must wait," replied the head of the expedition.

The familiar twin-engined monoplane flew like an arrow over the aerodrome, landed and taxied across to us. Golovin came down the ladder.

"Flying's impossible!" he reported to Schmidt. "When I reached the sea I ran into fog, and couldn't get by either over or under it."

Schmidt reflected for a moment.

"It's clear we'll have to wait," he said. "Inform Vodopianov of our decision."

Vodopianov was still circling round over Narian-Mar; he was uneasy at the long delay. Golovin went to the microphone and told him briefly what the weather conditions were and what had been decided. We waited anxiously: the chief's machine, like all the others, was heavily overladen. It weighed not less than 23 tons and before we started from Moscow the works' engineers, with some trepidation, had set the limit of load at 22½ tons. Landing in such an overloaded machine was dangerous:

the slightest mistake might capsize the machine, that is, bring it over on to its nose, or break the undercarriage.

However, Vodopianov decided to land, and bringing his flying monster down took the snowy surface at such a minute angle that we could not even tell the moment when it touched.

Gloomy and miserable, the members of the expedition got into the sledges and returned to the town. Dzerdzeievski cursed aviation and every geographical latitude; but at last, taking mercy on us, he foretold more or less tolerable weather for the morrow.

At dawn on April 12th, without even breakfasting, we all rushed to the aerodrome. At about six o'clock Golovin started off first as usual, and we were able to follow his course from radio messages. He flew North rapidly, and an hour and a half after his start announced that he had begun to get through the clouds. He tried once without success. The second time he flew higher and got out into clear sky at 4,500 feet. He was now flying on above the clouds in bright sun and with the wind against him.

"Take off, take off at once!" Shevelev said.

Raising clouds of snowy dust, the chief's machine rushed across the aerodrome. It ran more than a mile from one bank of the river to the other, but could not rise. The damp, sticky snow held it back—the speedometer stuck at 40 miles an hour. Vodopianov turned round, and again ran the whole length of the aerodrome—without success. The other pilots followed his superhuman efforts with dismay.

"We can't take off with such a load," Molokov said gloomily.

Seven or eight times Vodopianov tore up and down the gigantic river aerodrome, but he could not get his machine to rise. Taxi-ing over to the others, the pilot jumped out.

The chief pilots of the other 'planes and the leaders of the expedition walked across to him, and a conference was held right there, on the giant runners of the chief's machine.

"What shall we do?" Schmidt asked. "We can't miss this weather. We must fly, and we can't take off!"

After a brief discussion it was decided to lighten the machines. Two tons of fuel were taken from each 'plane. By doing that we cut out the possibility of a flight to Rudolf Land, as with the remaining store of fuel we could not fly, without landing, the thousand miles that separated Narian-Mar from the northernmost point of Franz Josef Land. Now we had to make for the Matochkin Strait station on Novaya Zemlya. Schmidt wirelessed to Golovin to alter course and make for the eastern coast of Novaya Zemlya, to land at Matochkin Strait and wait there for the squadron. When the petrol had been pumped out, the 'planes ran up to the starting line. This was one of the most difficult starts in the whole course of the expedition; our machine, for example, taxied along the aerodrome for a minute and twenty seconds—when we took off in Moscow we were on the ground for only fourteen seconds.

At last all the machines were in the air. The squadron soon got through the shroud of fog and was flying in sunlight. The chief set the course, and the other 'planes followed, flying steadily. Below them lay, in slight billowy curves, an illimitable plain of clouds. Across this plain, looking like hollows in it, slowly passed the round shadows of the 'planes, encircled by multi-coloured rainbows. The 'planes rose gradually to 6,000 feet. The engines were working beautifully, without a flaw. We almost forgot that the open sea, clear of ice, lay below us.

Suddenly the sea showed through a gap in the clouds. We were flying over fine pack-ice. From our height the blocks looked like crumbs, as indeed they were. Apparently

not one of them would have been able to carry even a small training 'plane. Wide, fantastic channels and great open spaces showed, through which a massed merchant fleet could have passed.

Soon the 'planes reached Novaya Zemlya, cut across it over the clouds and followed the Eastern coastline to Matochkin Strait. The coast to our left was so even that it might have been a cream mould. On our right lay the Kara Sea, covered with a film of freshly-formed, transparent ice, a scaly, plasmic surface from the coast to the horizon. Here and there small icebergs, covered with snow, looked like patches on it.

An undisturbed feeling of tranquillity possessed us. The engines monotonously hummed their song of might, and trusty hands guided the course.

After four hours' flying the flotilla reached Matochkin Strait. Below us lay sheer, irregular cliffs of unsurpassed beauty. The primeval land was intersected by dark defiles, faintly bordered with snow, and studded with hills and peaks. The minute buildings of the Arctic station showed in a hollow on the right shore of the straits, with Golovin's miniature 'plane close to the beach. Its orange colour was really marvellously clear from the sky! Vodopianov circled over the straits, slowly losing height, with the other 'planes in wide circles behind him. Gradually, one after the other, they picked out their place to land on the ice, and taxied to the beach.

We were in the Arctic. The mainland was far behind us: would it be long before we saw it again?

On the morning of April 14th it was decided to fly on. Lamps were lit and put under the engines. But suddenly the notorious wind of Matochkin Strait broke on us from the hills. Its intensity rose rapidly, reaching over 60 miles an hour. Its breath blew out the powerful lamps like

candles. We took them down and lighted them again, and put them back, but again they went out. The icy wind made our hands useless. We were coated with snow from head to foot, and icicles hung from our eyebrows and eyelashes. The cinema operator, Troianovski, rushed out along the ice and turned his handle rapturously. He was in a bearskin cap, and the look on his face was strange.

After a few hours it was obvious that it would be impossible to fly. We decided to make a holiday of it. Numb with cold, we climbed into the cabin and drank a bottle of brandy. It thawed us a little; but what could we eat? Ritsland dragged out a piece of pork: it was frozen to the bone. We tried to hack off bits with a knife, but without success. Then Frutetski got out a handsaw and began to saw off slice after slice.

Overhead the sun shone in a clear blue sky, as if mocking us. But down below the raging wind almost blew us off our feet. The other 'planes were barely visible. Soon a real, full-blooded Arctic blizzard began.

We were eating dinner with our hospitable hosts of the winter station when the man on watch ran up and informed us that the wind had reached a velocity of 80 miles an hour. A wind of such force might overturn the 'planes, and we had immediately to make them secure and put out ice anchors. A group of members of the expedition went down the steep shore towards the machines, but they were driven apart by the force of the wind, and it was only with immense efforts that they made their way back to the hut, from which they had only been able to go a few dozen paces.

It was then decided to run a hawser from the station building to the 'planes, to prevent men from being driven away from their goal. A steel hawser was secured in the wireless room, and holding on to it we started down. The going was heavy enough. An unimaginable stream of snowy

dust poured down from the hills, torn by the storm into fine powder. This dust drove in everywhere—into our pockets and our fur boots, through the fastenings of our coats—and covered all our clothes with a kind of transparent, icy lacquer. First one and then another of us fell and was unable to get up again. We crawled on our hands and knees. It would have been very amusing to watch the others' antics, but for the fact that it was necessary to concentrate all one's attention on keeping one's own balance. Everyone was staggering as though drunk, at one moment running forward a few paces, then stopping still, then crawling along to find the way.

And so we reached the machines and made the hawser secure, fastening it round the barrels of petrol. We had made sure of our way back! We had a look at the 'planes. The wind was blowing straight at their noses, and they were standing as if rooted to the spot. All the same it was necessary to make them secure, for at any moment the wind might get under their wings and smash them. Following Mazuruk's instructions we dug deep pits in the ice with our axes, laid logs in them, and fastened hawsers running from the 'planes to the logs; then we filled in the pits. Each 'plane was moored with several such ice anchors. The wind increased in strength. Some gusts reached a force of almost a hundred miles an hour. The temperature was 20° below zero. If we turned to the wind, our faces were immediately numbed. First one and then another of us noticed white spots on our companion's face, and then kind friends instantly began restoring their comrade's skin to its right condition, with such zeal that it almost came off in lumps.

The storm raged for three days. The 'planes held out splendidly. The only damage was in Alexeiev's 'plane, which was out in the straits—a gust broke the turning rudder.



5 SCHMIDT CONGRATULATES PILOT PAVEL GOLOVIN, WHO HAS RETURNED FROM A RECONNOITRING FLIGHT TO THE NORTH POLE

Sugrobov, the senior mechanic, strove in vain to detach the broken rudder in order to put it right: the fury of the gale made it impossible even to begin the work. Sugrobov spent some hours in the icy wind, woefully surveying damage, and then came to the chief pilot of the 'plane and said gloomily:

"Anatolii Dmitrievich—smash that rudder right off. I'll make a new one. It will be simpler than repairing the old one."

In the end, making use of the first calm moment, Sugrobov, Schmandin, Ginkin and Gutovski detached the fifteen-foot rudder from its supports and carried it carefully to the station workshop. There the mechanics worked feverishly, without sleep or rest, to get the repairs done.

At two o'clock in the night of April 16th Shevelev came to my room.

"Get up and take over the watch," he said. "If the wind grows stronger, wake me up—if it drops, also call me. If there's no change, then let me sleep."

But Shevelev did not go to bed. He went out of the house, with difficulty forced his way a few paces, and then hurriedly turned back, coated with snow from head to foot.

"It's snowing all right," Shevelev said in a respectful tone. "It's all these currents from the hills. It's no wonder pilots are so afraid of Matochkin Strait, and try not to get caught there. The first time I made the acquaintance of the squalls here was in 1932. I was then in charge of the Kara Sea expedition. Early in September ships that had passed through the middle of the Kara Sea reported that they had met ice at completely unexpected points. It was decided to make an air observation without delay. The hydroplane USSR N-Z was hoisted out from the ice-breaker flagship, and flew off to carry out a survey; pilots

Portsiel and Dalfons, navigating officer Ruchiev, and mechanics Chechin and Provarikhin went with me. When nearing Matochkin Strait we noticed a very heavy sea running in the straits near the wireless station. Portsiel flew on, searching for a less disturbed spot. That was a big mistake—although at that time we did not know what Novaya Zemlya storms were like. We had hardly passed Cape Poperechni when something incredible began happening to the hydroplane. First we were hurled three hundred feet up, then dropped plumb so that we were almost torn out of our straps. After three such tosses we began to be driven down to the water. Portsiel turned the throttle full on, and pulled the steering rod hard as far as it would go. The thought suddenly struck me that the tail had been torn off and that the 'plane was going down nose first. I glanced round—the tail was all right, and the rudder was up as far as it could go, right against the supports. Then there was a terrific crash and I lost consciousness.

"When I came to I was lying on the upper deck of the hydroplane, with pieces of ice rolling about round me. I worked out where I was calmly enough and was in no hurry to get up; my mind was evidently still suffering from the shock of the impact. Then the thought came into my mind: where are the others? I jumped to my feet in an instant and began to look round. The storm was raging in the straits, the wind was blustering and roaring, and waves were rolling across the part of the deck where I was standing. Then I saw Chechin. A piece of timber had cut through his leather coat from the bottom right to the collar; then the force of the blow had petered out, and Chechin was left hanging in the void, suspended by his collar. Working free with my help, he pulled himself out and satisfied himself that he was absolutely unscathed. A few seconds later some head, wearing glasses, appeared in

front of us. We tried to shout, but the wind was roaring so loudly that the head could not hear us. Then the head disappeared, and emerged again under the wreck of the hydroplane. Chechin at once grabbed at his comrade's helmet, but as the helmet was wet Chechin's hand slipped and in fact he pushed him under. I held out my hand to him, gripping a broken upright with the other. Chechin hung down from my hand, and with his other hand grasped Provarikhin. Then I pulled them both out. How I managed to pull the two men out with my left hand I don't understand to this day. We saw no one else on the surface of the water. It was only later, that we succeeded in finding the bodies of our other comrades: Portsiel, Dalfons and Ruchiev.

"What had happened to the hydroplane? It appeared, that winds of incredible force frequently blew down from the hills of Novaya Zemlya. Our machine must have encountered such a mighty blast. The engine could not keep going against the wind, the hydroplane was forced down, and then the wind dashed it into the sea. The fuselage was held back by the resistance of the water, and the nose flattened out, but inertia carried the engine and wings rushing on, and they snapped the stays and struts. Provarikhin was in the engine gondola and went down with it. He contrived to dive clear at the very moment when the engine turned over and settled on the bottom. An instant later he might have been crushed under the engine.

"The accident happened about a mile from the shore. Surveying our territory, we saw that we were sitting on what was left of the tail of the boat, which was gradually settling in the water. Provarikhin had struck his head on something, and this affected his mind—he began to chatter senselessly. My right leg was paralysed. Our wreck was stationary in the same place. It seemed that the wires running from the engine gondola to the boat had remained

unbroken, and the engine lying on the bottom was acting as an anchor. All efforts to saw through the wires were unavailing. More and more water was coming through the cracked fuselage, and our 'island' was rapidly sinking into the water. We tried to inflate the small rubber boat, but it had been badly damaged in the crash and was not airtight. We improved its buoyancy somewhat with wood broken off from the hydroplane; then with immense difficulty we got into it, cast loose and reached the shore.

"We were worn out bodily and mentally, and ready to collapse from sheer exhaustion. But to rest meant to die like a dog—it meant falling asleep, and to fall asleep meant death. It was necessary at all costs to reach the Arctic station, which was some thirteen miles away. So I gave the order to my companions: 'Go right on to Matochkin Strait. Don't stop till you reach the station. Ask them at the station to come out to meet me.' With my bad leg I could not keep up with them, and I dragged myself quietly on behind them. Night fell. The storm raged, and an icy wind blew down from the hills; it was very heavy going. There were hills and deep defiles the whole way. I moved quickly downhill, getting down the frozen hillside almost like a sledge, but the uphill scramble was terribly exhausting. And my right leg was out of action, so I had to crawl up, digging my fingers into every crack. I was overcome with rage once when, after crossing a deep defile, I saw that by going a little further I might have got round it along a level surface.

"My condition was strange enough. I felt a kind of dual personality. Evidently the deep mental depression following on the crash and the extreme physical efforts I was making, caused me to become abnormal. It seemed to me that I was a disembodied spirit slowly advancing into the distance, while alongside me came a body, harassed, maimed and

exhausted, and unable to take another step. And I—the disembodied spirit—had the body under my control, and was ordering its every movement: 'Step out! Turn! Climb up! Go down!' and so forth.

"At last I climbed down for the last time past Cape Poperechni, and followed a more level route. Then for the first time I permitted myself to pause. Leaning against a rock, I decided to stand still while I counted thirty. As can be imagined, I counted very slowly, and the last numbers were simply drawled out. Then I went on. When about half a mile from the station I made out a group of people coming to meet me. And that finished my pilgrimage.

"We found the bodies of Portsiel and Ruchiev only after a day's search. The waves had washed them up on the shore of the straits. The doctors ascertained that death was due to internal hæmorrhage caused by the impact; there was no water in the lungs. We found Dalfons only when we raised the hydroplane from the bottom. He had been crushed by the 'plane and forced to the bottom. Such was my first experience of a Novaya Zemlya storm," Shevelev said, bringing his stirring story to a close.

At four in the morning the wind fell a little. It was then blowing at about 55 miles an hour, not more. I roused Vodopianov. He went out into the "street", surveyed the murky horizon with a sceptical look, and returned to the wardroom covered with snow.

"We can fly," he said in a not altogether convinced tone. "Let's rouse the others."

We went from room to room, rousing our comrades. They got up unwillingly and dressed, heavy with sleep. A murky dawn showed through the window, outside which the wind howled and whistled. They had had two hours' sleep.

"It's a pity to wake them," Vodopianov said. "See how sweetly they're sleeping!" Then he frowned, dug a sleeping

man in the side, and passed on to the next. We went softly into the room where Golovin and his crew were asleep. Vodopianov shook Golovin by the shoulder for some time.

"Wake up, Pasha!" he shouted. "It's time to fly!"

At last Golovin raised himself on his elbow.

"Come on, you gangsters, get up!" he roared fiercely, and began throwing clothes, boots and books at the sleeping men.

In quarter of an hour we were all down by the 'planes. The storm had driven snow into the engines. It was necessary to heat them, for there was no contrivance that could have cleared the mass of snow out of the recesses of the motors. A group from the station undertook to dig out the runners of the 'planes. Snowdrifts reached almost to the belly of the fuselage. It was necessary to dig out a trench nearly nine feet deep.

"Mark Ivanovich," Golovin said, going up to Shevelev, "I'll take off at once, but I want to report that there's only petrol for seven hours' flying in the tanks. I can reach Rudolf Land, but if it's impossible to land there I won't be able to fly back."

"What about it?—take off!" Shevelev answered quietly.

At a quarter to eleven Golovin started off. At that time the other 'planes were still being made ready to start. All of a sudden there was a burst of thick black smoke from the starboard centre engine of Vodopianov's 'plane.

"Fire!"

From every direction the members of the expedition came running to the 'plane. Bassein, senior mechanic of the flagship, rushed headlong into the 'plane and immediately closed all the taps of the petrol tanks, and leapt out with a fire-extinguisher. Mechanics from the other 'planes had already stripped off the casing and were smothering the

flames. Within a few minutes the fire was extinguished, and work was resumed.

Towards noon the weather grew worse again. Once more it was necessary to postpone the flight. Schmidt ordered Golovin by wireless to return to Cape Jelaniya and land there. By that time Golovin was already over the Barents Sea. He was flying above the clouds at a height of 6,000 feet. Realising that Cape Jelaniya also would be hidden by cloud, Golovin decided to pierce the cloud and fly to the landing-ground under it. But as soon as he came down a little, ice formed on the 'plane, and he immediately jumped back again into the clear blue sky. The ice disappeared. Again he tried to come through the cloud, and once again ice formed on the 'plane. Then Golovin was forced to cut across Novaya Zemlya again and follow its Eastern coastline to Cape Jelaniya.

It was only on April 18th that we succeeded in getting off the ground. The take-off was very difficult. There was a gale blowing on the ground, and the mechanics laboured like heroes all night and all day, never leaving the machines. It was only late in the evening that we managed to break out of our enforced captivity at Matochkin Strait, which quite justly enjoys such an unenviable reputation among pilots and Arctic explorers.

A cloud cap, lit up by golden sunlight, hung over the mountains. The purple of the sunset changed into a soft rose colour. Twilight crept on imperceptibly, and visibility grew poor. The clouds spread out compactly, like a blanket. Open sea was visible only now and then, on our port side, through gaps in the cloud; at times we caught sight of the craggy coast to starboard.

A little later Spirin, the chief navigating officer, led the squadron straight across Novaya Zemlya. Down below us gigantic mountain ridges spread out in every direction, in

chaotic disorder, as if they had just been thrust up from the earth. Wild, half-uncovered slopes were intersected by narrow ravines. Here and there, piercing through the blanket of cloud, the rugged peaks of mountain heights rose into the sky. The thermometer registered 23° below zero. The glass in the portholes was covered with frost. I blew on it to clear a spyhole, and looked down. Orlov came up to me.

"Bad luck!" he said. "The thermos flasks have frozen. There's nothing to drink."

We broke one thermos flask open with an axe, and sucked the ice. Only two hours ago these brown pieces of ice had been nice hot coffee.

Midnight came. And there, to the North-West, almost directly in front of us, the sun rose. We were the only people on earth to see this marvellous phenomenon: the sun rising in the West! Such a thing happens only in the Arctic. We were drawing near to the region of the Polar day, where the sun never sets throughout the summer. We had as it were caught up with the celestial orb.

"Land!"—the traditional exclamation of all voyagers rang out.

In front of us we could make out the islands of the Franz Josef archipelago—flat, serrated and rocky. In the straits between them we could see droves of icebergs, which from our height looked like grains of sugar scattered over a white tablecloth. It was cold. The sun was cold, the air was cold. We were all clad in furs from head to foot. Heavy coats of fox fur impeded our movements a little, but walking in fur boots is really pleasant: we walked lightly and our feet kept warm.

"We've arrived," Ritsland reported to Molokov, pointing down.

The aeroplanes were sailing over a white island. We could see the toy-like masts of the radio station and the

diminutive huts of the winter station. One after the other the 'planes settled on the landing-ground. We were enthusiastically received by the whole population (twenty-four human beings!) of the Arctic station on Rudolf Land, the northernmost station in the world.

In the line of fire

Hardly had the 'planes landed when tractors arrived and pulled each into its appointed place. The members of the expedition scattered over the field, and surveyed with interest the long-anticipated aerodrome on latitude 82° North. It was a wonderful cloudless day. The air was almost still, the sun was shining brightly, and the crisp snow crumbled to dust under our feet. The spring sun and the blue sky were in sharp contradiction with the thermometer, which showed 23° of frost.

The aerodrome on Rudolf Land was situated on an ice hill rising about 900 feet above the level of the sea. Preparing for the arrival of their guests, the staff of the winter station had made a large hut out of boards and beams; they put it on gigantic runners and towed it with tractors to the aerodrome. This was the first experiment in moving a building in the Arctic. The red flag was flying over the hut, with a cone showing the direction of the wind. Inside the hut there was a workshop, bunks, sleeping-bags and a telephone linking the aerodrome with the winter station, which was two and a half miles to the West, on the shore of Teplitz Bay. Near the hut were ranged caterpillar tractors, sledges and tank lorries. Far to the South we could see the rugged, icebound capes of Karl Alexander Land; the sharp peaks of icebergs glittered in the sun, and Queen Victoria Sea, almost clear of ice, shone dark blue to the horizon.

"It's a grand island," Schmidt said approvingly, and gave the command: "To the 'planes! Start unloading all of them immediately!"

All hands set to work on what seemed an unending task. Night came. On the "big land" theatres were only just emptying, but here the sun was shining in an intolerable way and people were working without a thought of sleep or rest. It was thirty-six hours since they had last slept, and they had had their last hurried meal at noon on the day previous, but no one left the aerodrome even to go into the little staff hut. Working feverishly, we discharged food, equipment, spare parts and supplies from the machines. The insides of our gigantic 'planes were inexhaustible. Mountains of food, instruments, arms, snowshoes, tents and all kinds of cases, bags and metal containers piled up on the snowy field.

Papanin's group worked swiftly and intensively. While we were still in the air Papanin, as soon as he saw the familiar contours of Rudolf Land, began to get excited. As soon as the aeroplane runners touched the aerodrome he jumped out of his machine and, stumbling in the deep snow, rushed to meet the welcoming crowd.

"Where are the tarpaulins?" he shouted. "Where are the things to be put? We are in a great hurry."

He quickly exchanged greetings with his friends of the winter station, whom he had himself brought there the previous year, and then he rushed into the attack on the cargo. His faithful comrades rushed after him. The aeroplanes had brought with them about three tons of things for the winter station on the drift-ice. The Papanin group would trust no one to discharge their cargo. They went from 'plane to 'plane, carefully taking down tins of food, metal tent tubes, emergency spare parts, instruments, accumulators, reserves of fur clothing; then they put it all on

tractors and took it to the hut, where they sorted it out carefully and spread tarpaulins over it. By eight o'clock in the morning the work was done, and the lorries and tractors took us across to the winter station. We could see it in the distance, from the slope of the hill, with its small, low buildings like the houses of the steppe-dwellers, and its radio masts.

A white bear, which had been shot the day before and was now frozen stiff, stood at the entrance of the main building; it was bowing low in a salute of greeting, and holding out in its paws a salver framed with a towel and carrying bread and salt. A heavy iron chain hung down from the bear's mighty neck, with a substantial "Key to the Pole" at the end of it. Schmidt went up to it, felt the weight of the key with his hand, and said reflectively:

"If the key is as big as that, how big must be the lock!"

The tables in the wardroom were breaking under their load of sausages and hams, bacon, briskets, *hors d'œuvres*, pasties, all kinds of preserves, vodka, wine and brandy. The walls were decorated with messages of greeting and portraits. Along the whole length of the partition ran the wall newspaper "Latitude 82° North". Vanya Schmandin, one of our mechanics, walked up to the newspaper and extended its name so that it read: "Latitude 82–90° North".

After our heavy work and our two days' vigil we were worn out, but long after we had fallen into a dead sleep the Papanin group was still going on with its activities at boiling point. They were examining the food packages, looking through the scientific equipment and putting together the sledges.

"We shall work till it's dark," Papanin announced.

One of the staff of the winter station reminded him, in a tone of surprise, that at this latitude it would not be

dark before October. Papanin laughed and corrected himself:

"Well, then, till evening!"

They went to bed at eight o'clock the following morning, having kept on their feet three whole days.

For us it was another case of all hands to the job when next day came. It was necessary to ensure that each machine carried an adequate supply of petrol. The flight that lay before us was long, difficult and dangerous. No one could say how many flying hours the flight to the Pole and back would take, and for that reason it was decided to fill all the tanks right up to the stoppers. 1,980 gallons of petrol!

It was a real labour of Sisyphus. A blizzard was raging on the aerodrome. The savage wind lashed our faces so painfully that we were compelled to walk with our backs to the wind. We were clad from head to foot in furs, but nevertheless we were mercilessly frozen through. The crews, led by the captain of each 'plane, dug barrels of petrol out of the snow, loaded them on to tractor-drawn sledges, and ran them down to the aeroplanes. Then came the heaviest part of the job: pouring the petrol into the tanks. Every gallon of petrol had to be pumped up with a hand-pump. It was heavy work! Our hands started aching at once. We were not used to it, and our fingers grew numb. After twelve hours of intense and uninterrupted labour the crew of our machine finished their job. The crews of the other 'planes were only through with it by the following day.

After a sleep, the mechanics immediately began a careful inspection of the motors. They meticulously tested each cylinder, compressor, ignition, pipe, tap, wire and control. Practically nothing had been damaged.

But we still had days of intensive work ahead of us. The Papanin group worked particularly hard. At any hour



6 SCHMIDT (left) AND SPIRIN PLAY WITH THE WHITE BEAR CUBS

they could be seen at the job. At one time they would be sitting in the electricity station, charging the accumulators of the wireless transmitter for the Pole; at another time they would be inflating their rubber boats, or leading dogs bringing equipment of some sort to the aerodrome. Neither the frequent squalls, nor the blizzard, nor the intense cold could cool their ardour. They made a general examination of all the equipment and apparatus for their floating station. For two days Feodorov made patient observations and collated the extent of the magnetic deviation of Rudolf Land, at the same time investigating the accuracy of the instruments and the method of his research work. He tested the theodolites and sextants, and using the astronomical method determined the position of Rudolf Land; he was glad to note that his calculations coincided with the position given on the charts. The wireless station for use at the North Pole was assembled and tested with no less care. Krenkel sat by the apparatus in all conditions, through bright sunny nights and through days when raging blizzards beat down mercilessly. The wireless station worked splendidly; Krenkel listened in to the Kremlin chimes, the sowing reports from Novosibirsk, the hysterical outpourings of the German wireless stations, and foxtrots from far Brazil. Isolating himself in the engineering workshop, Shirshov reassembled the deep-sea windlass and tested the mechanism of the balometers and water-meters. Meanwhile Papanin was busy with the equipment. Near the winter station a whole village of tents for the floating station was erected: living-tents, hydrological, gravitational, tents for provisions, workshops and many other purposes.

Preparing the store of paraffin—the main fuel for the Polar camp—was particularly troublesome. Special rubber balloons holding about ten gallons each served as containers. The paraffin had first to be sucked out of the original

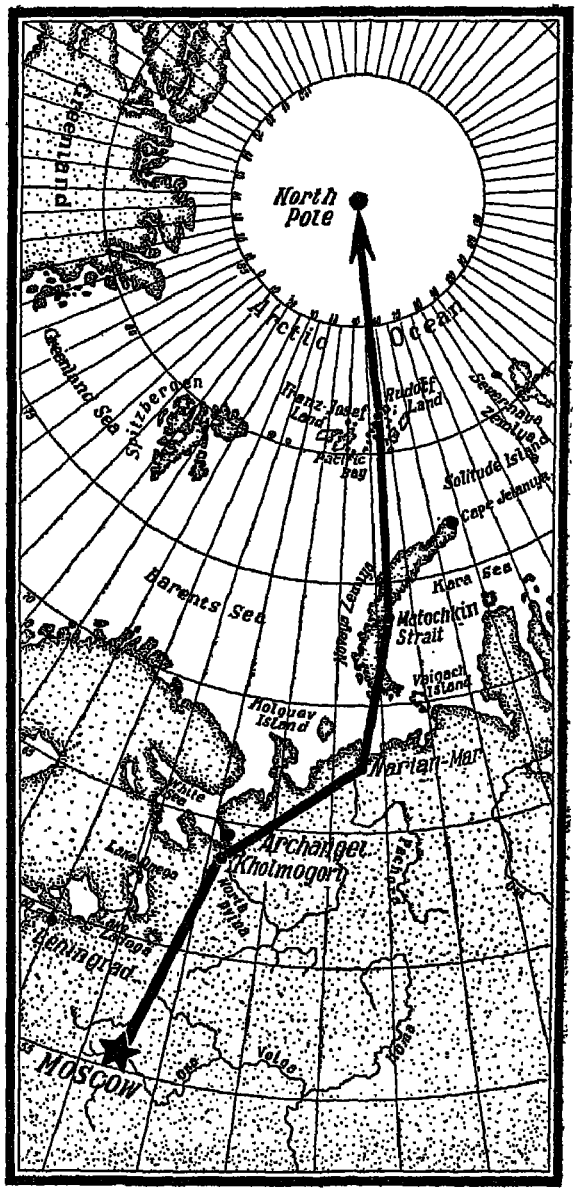
tanks, after which it was made to flow slowly into the balloon. And that had to be done sixty times!

"Ugh!" Krenkel said when the operation was completed, and spat. "I've had enough paraffin to last me a lifetime. Don't come near me with your cigarette—I'll burst into flames!"

Having examined, tested and sorted out all their belongings, the Papaninites once again transferred all our things to the aerodrome. Here every packet was placed on the scales, and weighed with great accuracy, for there was a limit to the carrying capacity of the 'planes, and every kilogram was subjected to the strictest calculation.

All spare parts and details and everything that was superfluous was unloaded from the aeroplanes, making a huge pile round each machine. Ivashina, senior mechanic of the N–171, walked restlessly round these piles. Often he would sigh and try to smuggle back some item into the aeroplane, but then he would meet Molokov's reproachful eye and, somewhat abashed, would put it back in its place —but he would go on wandering round as if moonstruck.

A week after our arrival a general mobilisation of the population of Rudolf Land was again declared. On this occasion we loaded the belongings of Papanin and his friends into the 'planes, each of which was supposed to take 5,180 lbs. of the things for the station. Once again tents, instruments, collapsible boats, motors and sledges disappeared into the insides of the gigantic 'planes. The capacious cans of provisions for the Polar station were distributed equally among the machines. During the flight to the Pole one of the 'planes might find itself in a calamitous position. In that case Papanin's supplies would give the crew of the unlucky 'plane a chance of holding out until a rescue party arrived. With the same aim in view 80 kilograms of food, packed in special parachute bags, were



ROUTE OF THE FLIGHT

loaded on each 'plane. If one aeroplane came down, the other 'planes, seeing their comrades in distress, would either land and pick them up from the ice at once, or, if it was not possible to make a landing at the moment, they would throw overboard to them some of the supplies attached to parachutes.

The Papaninites took with them only the most essential things. They counted on taking some of the supplies with which the aeroplanes themselves were equipped, once they arrived at the Pole.

"I shall doff my cap and go a-begging to the machines," Papanin said with a laugh. "One will give us a tea-pot, another a Primus, and the third a superfluous bucket. You'll all fly back without your shirts. But you'll be going South, so it won't matter."

The organisers of the expedition had mobilised all forces and resources to open the way to the North Pole. Two aeroplanes had wintered at the South of the archipelago, in Pacific Bay. On April 28th Golovin had flown to Pacific Bay, with the pilots Moshkovski and Kruze on his 'plane. Golovin came back the same day, followed by the U–2, piloted by Moshkovski. Kruze remained at Pacific Bay to put the 'plane P–5 in order, and on the first clear day he brought this machine too to the central aerodrome on Rudolf Land. These light machines were at once put into use for maintaining communications and for short-distance observation flights. Navigating officers and wireless operators sat shut up in the cabins, testing how the compasses worked and the direction finders, and tracing the course of the flight out and home.

At last everything was ready for the attack. On the aerodrome of that distant Arctic island, crouching for their gigantic leap, a whole air flotilla was drawn up: four heavy four-engined vessels, a powerful two-engined aeroplane and two air taxis.

"What an instructive spectacle!" Schmidt said thoughtfully as he inspected his air armada. "If the Bolsheviks can assemble such a menacing armada here on the 82nd parallel, what will they not be able to do in more Southern latitudes should the need arise!"

The days went by. The Papanin group worked among the others, carrying out their own tasks, helping others, and chafing at the unfavourable weather. Some evenings Shirshov and Feodorov tried to organise expeditions on snowshoes, but soon they were strictly forbidden to do this.

"How can you do such thoughtless things?" Papanin grumbled at them. "Each of you has cost the State a tidy sum. And what if one of you happens to break an arm or a leg? The winter at the Pole station would be broken up —and it's the State that would be the loser."

"Ivan Dmitrievich, when I see a hole I throw myself down," Shirshov answered, trying to justify himself. But when he met the chief's reproachful eyes he blushed and added rather shamefacedly: "All right, I won't do it any more."

Often, taking turns, the Papanin group would come into the rooms where the other members of the expedition were, and listen eagerly to the inexhaustible tales of the pilots and Arctic explorers about their various experiences, some of which seemed fantastic.

"We purposely decided to come one by one," Krenkel explained. "We listen to you and pick up stories to last us the whole year. Each of us will tell the stories we heard, and we shall have enough for the year."

Sometimes after supper they would discuss with Schmidt the prospects for their work. They would point out where the drifting ice might take them. The laws followed by the drifting ice masses of the central Polar region are

unknown. Perhaps the ice-floes would take the four courageous men to the shores of Canada, perhaps to Chukotka, or perhaps to the Greenland coast.

"Eh!" Papanin said reflectively. "If only it would take us into the region inaccessible to man! What a lot Soviet science could get out of it!"

"But aren't you afraid?" Vodopianov asked with a smile. "It will be difficult to get away from there."

Papanin was about to reply. But he was interrupted by Ginkin, the mechanic.

"They sent me here from a military unit," he said. "I remember—the commandant called me up and asked whether I should like to go on a great expedition, but he warned me that those who went were risking their lives. I was very much perplexed. What sort of a place was it in the Soviet Union where I could lose my head? There wasn't such a place!"

Insistently we kept hoping for fine weather. The wireless operator of the winter station, Bogdanov, did without sleep. From early morning and to early morning we would be receiving reports from Soviet, European and American stations. Here in the little hut calculations were made of the weather in the Arctic zone of the Soviet Union, the winds in Scandinavia and Britain, the temperature in the countries of Central Europe, and meteorological conditions in North America. Every day Dzerdzeievski assembled one by one the separate data from 320 stations, working out the courses and mutual influence of cyclones and anti-cyclones. As if out of malice, nothing but cyclones kept passing us in an unending game of leap-frog. Anticyclones, carrying with them good flying weather, hid themselves in the Northern recesses of Canada.

On April 28th we had our first flying accident. Spirin, the navigating officer, with Feodorov, our magnetological

expert, and Ivanov, wireless operator, went out in the aeroplane U–2 to test the work of the wireless beacon. They took with them an emergency wireless set, a rifle and cartridges and—because of Schmidt's insistence—ten packets of chocolate, a pound of salt meat and a loaf of bread.

"You idiots," Schmidt told them, "you're flying in the Arctic! If you go out for half an hour—then take food for a day."

Spirin set out in his fur coat, Ivanov in a fur shirt and leather raglan, and Feodorov, showing foresight, put on his fur suit. They were to fly about fifty miles and then land to test the audibility and accuracy of the signals from the wireless beacon. According to plan they were to return about ten o'clock in the evening.

We set to work at the main aerodrome, getting Golovin's aeroplane ready for the flight. At midnight the mechanics Kekushev and Terentiev flung themselves down on the bunks, prepared to sleep for not less than twenty-four hours after their exhausting work.

"It's not so terrible to do a day's hard work," Kekushev murmured, half asleep, "if you can only get a good sleep afterwards."

At that moment the telephone rang. Shevelev wanted a tractor sent to the winter station. Schmidt and Shevelev intended to come to the aerodrome. Why such a hurry at one o'clock in the morning? The lads decided in any case to go to sleep again as soon as they could. Another telephone ring:

"Nikolai Lvovich, Shevelev speaking. It is necessary to take off at once to search for the U–2. Get the lamps in position and warm up the engines. Hurry with it, as the weather's rapidly changing for the worse."

Without answering, Kekushev silently replaced the earpiece on the field telephone. Then he turned to us and said in almost a guilty tone:

"Well, that is the end of our good sleep!"

Golovin did not succeed in taking off. While they were pumping in more petrol and warming up the engines the weather became worse. The hill was hidden by fog, and it was impossible to start. The flight was temporarily postponed. No news of any kind came from the U–2. In the morning some of the staff of the winter station set off with dog teams to search for the lost aeroplane. They took with them food, medical equipment, warm clothing and accumulators for the wireless station. Towards evening it cleared a little. Golovin set off with Shevelev to search for the 'plane. A dense wall of cloud fourteen miles from Rudolf Land compelled him to turn back. No one left the aerodrome; it was decided to wait for an improvement in the weather. We flung ourselves down anywhere we could, and slept huddled up on the floor, on benches, tables and stools. Every five or ten minutes someone would go out onto the flying-field and make a critical survey of the horizon; was it not clearing a little? The others would guess what it was like from the expression on his face. And at last on April 30th, when everyone was sunk in a dead sleep, Pitenin flung the door wide open and shouted wildly:

"They've come back!"

We rushed out. The U–2 was circling round us overhead, hardly discernible in the fog. With a pilot's instinct for a familiar spot, Spirin had recognised the field; he piloted the machine to the runway and made a good landing. His crew, content and happy, climbed down from the cabin. We threw ourselves on them and plied them with questions.

"Nothing out of the way," Spirin told us. "We flew fifty miles from Rudolf Land and landed at Back Channel. We made all our observations, then began to crank up the

engine, but it seemed it had got frozen in the meantime. We couldn't get it to turn anyhow! Several times we tried to get it going with the help of the shock absorber—but it didn't work: there were too few of us to tauten it sufficiently. Then we selected a fair-sized ice-block and decided to fasten one end of the shock absorber to it. The ice-block was some hundred yards away, and so we three had to pull the 'plane to it and it took us almost a whole day. When we got there —we wound up the motor and flew off. That's all there was to it."

"Were you starving?"

"How could we be?" the navigating officer said in a tone of surprise. "The food we had would have lasted us another few days."

A Scout over the Pole

On the evening of May 4th a strong wind dispersed the clouds and then died down, leaving a wonderful sunny day. Pilots and explorers, who had longed so much for a clear sky, felt their hearts leap with excitement. Midnight came, but no one went to sleep. Everyone was in animated discussion on the possibility of a flight to the Pole; hypotheses were put forward as to the wind and cloud conditions in the highest latitudes. Only Dzerdzeievski tried to cool down the general ardour. In his view, the region of the North Pole was covered with cloud. It was therefore impossible to land there, and if that was so, there was no point in flying there.

But we had waited so long for fine weather, and the sun was so alluringly bright, that no one felt inclined to abandon the idea of the flight. Sensing the general excitement, Otto Yulievich suggested that the U-2 should go up and make a survey from a great height. A dozen hands helped the mechanics of the aeroplane to start the

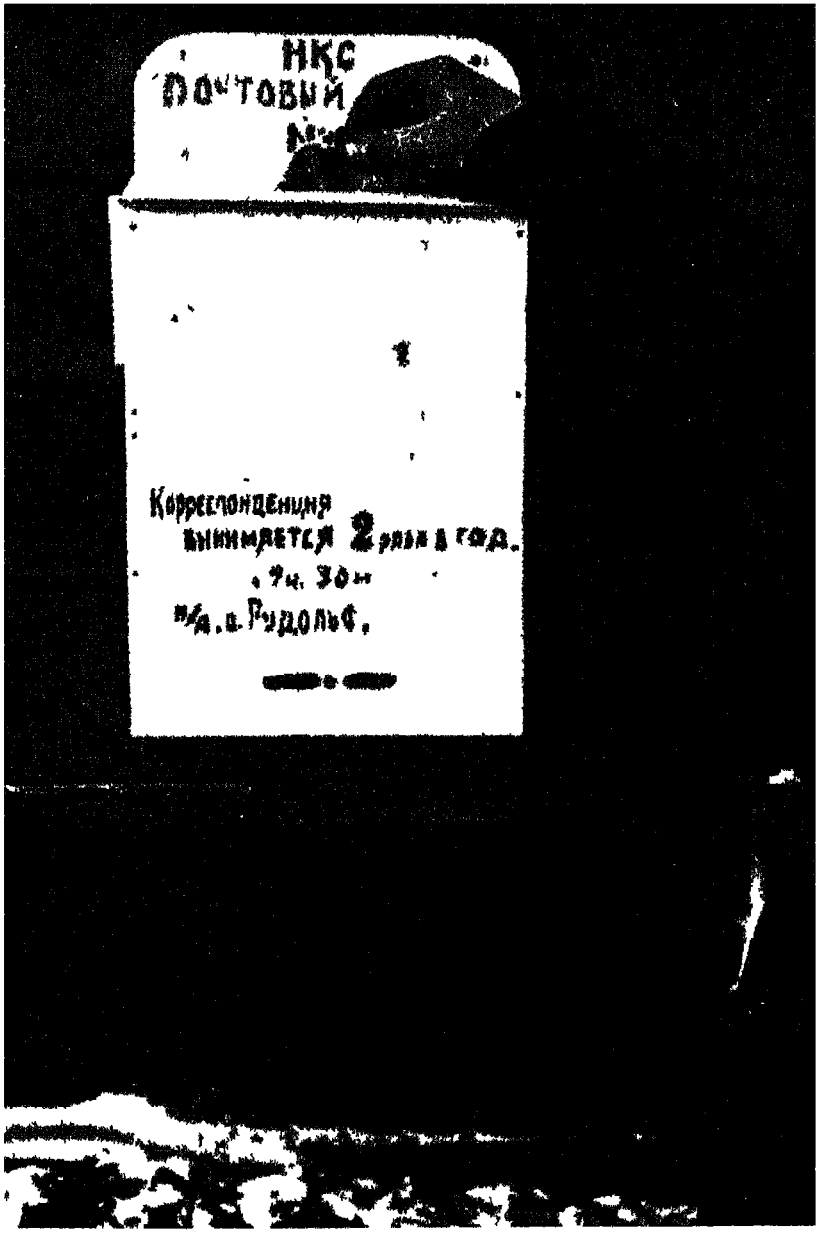
engine. Moshkovski and Dzerdzeievski took their places; the machine took off easily and went up. An hour later Moshkovski taxi-ed the 'plane back to the hut. For the first time in these latitudes an aeroplane had attained a height of over 10,000 feet. The results they brought back promised comparatively favourable weather conditions over a considerable area. And then Schmidt gave instructions for Golovin's 'plane to be sent off to make a more intensive survey in the direction of the Pole.

"Lie down and get some sleep," Shevelev told the pilot. "You'll take off in an hour and a half's time."

And exactly at six o'clock Shevelev, with polite apologies, roused Golovin and his comrades. A few minutes later a lorry was already carrying them to the central aerodrome on the hill. While the mechanics Kekushev and Terentiev warmed up the motors, Golovin verified the cargo. Everything was in its place. 2,350 kilograms of petrol were in the tanks. Six weeks' supply of food, a tent, a collapsible boat, a sledge, snowshoes and rifles lay in the wings and centre of the 'plane.

The engines hummed. Volkov, navigating officer, mechanics Kekushev and Terentiev, and wireless operator Stromilov, took their places. They were all clad in furs from head to foot, with dark glasses fitted to their helmets to protect their eyes from the dazzling light. Golovin glanced attentively at the horizon, shook hands with his friends who were not going with him, and clambered up by the wing into the cockpit. A tractor went in front and pulled the 'plane to the starting line, the pilot opened the throttle, the machine moved slowly forward—and then stopped. It was overladen by almost a ton and a half, and the frozen crust on the snow held it stubbornly like a vice.

Then the pilot decided to take off down the slope. He turned the 'plane and rushed it down the hill. Rapidly



MAIL BOX ON A LORRY AT RUDOLF LAND
The inscription says "Mail is collected twice a year"

gathering speed, it moved down the slope and at 11.23 a.m. rose into the air. Turning beautifully, Golovin passed low over the aerodrome and then flew towards the winter station, described a circle over it and then set off on his course. Within a few minutes the aeroplane USSR N-166 had vanished to the North.

"To the machines!" Vodopianov's command rang out. "Put the lamps in position!"

We all waited anxiously for the scout's report. As soon as they were in the air Stromilov established communication with Rudolf Land. Schmidt, Shevelev and Spirin hardly left the wireless hut, reading the wireless messages as Bogdanov's pencil moved. Golovin, with epic calmness, reported crossing each parallel: there he was at the 84th, the 85th, the 86th. . . .

It was almost as if Golovin was doing an every-day job, carrying out current survey work on the ice somewhere by the Nordensheld Islands close to the mainland. In the short twenty-eight years of his life this Arctic flier had made many flights over surfaces of snow and ice. While still at school he had been attracted to gliding, and had somehow managed to learn to fly an aeroplane. In 1930 he received his pilot's certificate, and was offered the post of instructor at the Central Aeroclub of the U.S.S.R. Three years later Golovin went to the Arctic—whence he returned only when on leave. He flew first to the Kara Sea; then he carried mail and furs along the Yenisei; later he flew to the Laptevik Sea, opening up new airways to Vodochanka and Khatanga.

On many occasions he found himself in serious difficulties. Once, with a damaged engine, he had to remain in his aeroplane for twelve days in the Kara Sea. On another occasion Golovin's engine gave out when he was flying over the forest near Podkamennoi Tungusk; the pilot noticed

a small ravine in the forest, and managed to come down safely on its edge. It was clearly impossible to take off from there; after a search, Golovin found a suitable ground three miles away. Working with his mechanic, who was as broad-shouldered as Golovin, he took off the wings and the two of them dragged them to the ground they had selected. Then the pilot sat at the controls, the mechanic started the engine, and Golovin—in the fuselage alone, without its wings—taxi-ed along a forest road to his projected aerodrome. There they again attached the wings, took off and continued their journey.

And now, simply and without embellishment, he reported his movement in a straight line forward to the North. "Weather clear, visibility excellent, pack-ice, many fields. All in order." Such was the content of all his messages.

Encouraged by this significant news, the mechanics of the heavy aeroplanes finished getting everything ready in record time. One after the other the propellers began to move. The runners, buried under a layer of snow a yard thick, were cleared.

"Stop work!"—the order was passed round the aerodrome. "The Pole is covered with cloud. Golovin is flying at a great height and there's no gap showing."

At latitude 88° North the aeroplane N–166 had met a wall of cloud; it gained height and went on above the clouds towards the North. And now it was already close to the 89th parallel. Only a little over sixty miles remained to the North Pole. We all followed the brilliant flight of our daring five with intense concentration. And side by side with our sincere admiration for their courage, we were very uneasy: will they have enough petrol for the flight home? Shevelev, Vodopianov and Spirin, pencil in hand, reckoned out the quantity in hand and the quantity required. It would just hold out.

"Call them back," Schmidt said after some hesitation. "We must not risk their lives. But frame the wireless message in such a way that Golovin, if he is sure of getting back, may risk going on to the Pole."

A minute later Bogdanov was rapping into the ether:

"Take maximum height stop see what ahead and return Rudolf stop Shevelev."

Golovin continued his flight. At 16.32 his laconic message arrived:

"Latitude 90 stop Pole under us stop but covered thick layer cloud stop failed pierce through stop laid return course stop Golovin."

Everyone applauded. Victory! The first Soviet airmen had reached the North Pole in a Soviet aeroplane. They had proved that they could fly anywhere, carrying out the instructions of their Party and their Government. All the members of the expedition were full of a feeling of pride in their country and an abounding patriotism.

We all immediately rushed to the aerodrome. But how changeable is Arctic weather! Fog was creeping over the ice hill on which the main aerodrome was located. At first it was thin and transparent, but gradually it thickened up, grew more solid, and shut off the sun, and soon it was no longer possible to distinguish an aeroplane a hundred paces away. Then clouds floated past. But six miles to the North of the island the sun was shining as before, and there was no fog at the winter station. We lighted bonfires at the corners of the aerodrome, but we all realised that in such a fog it was impossible for an aeroplane to make a safe landing. Then Shevelev suggested that Golovin should land at the smaller field near the winter station from which the U–2 usually took off. There was no other way out. We quickly marked out the edges of this improvised aerodrome, laid out the landing "T" and got the smoke

faggots ready. We informed Golovin of the plan for his landing.

But there was no Golovin, though the time he was due back had already passed. The aeroplane had all the time been flying to the island guided by the wireless beacon, and suddenly in some way it had jumped outside of the guiding zone and had got lost. We could tell from its signals that the aeroplane was somewhere not far off and was circling in the region of Rudolf Land, but was unable to find it owing to cloud and fog. The petrol in its tanks was nearly exhausted, and the situation of the crew might become tragic. We all silently watched the murky horizon. Pilot Mazuruk took off on the aeroplane U–2 to make a search. He came back soon, not having found anything.

"The 'plane!" Schmandin cried. There was a general sigh of relief. The aeroplane, low down over the open water, was coming in to the island from the West. It whizzed over the huts of the winter station and came full tilt to the landing-ground. Time: 22.45. Lightly touching the snow at the letter "T", the aeroplane ran along the aerodrome; but all of a sudden the left engine stopped, and the machine disappeared behind a hill. We all rushed headlong forward. Running up the hill, we saw the aeroplane: it was standing at the very edge of a steep cliff down to the sea. Realising the danger, Kekushev and Terentiev had jumped out while the 'plane was still moving and, hanging on to the struts of the undercarriage, had braked the movement as much as possible.

Golovin climbed down from the cockpit. Moving his swollen hands and feet with difficulty, he exchanged greetings in a tired and rather wooden way with his comrades, who greeted him enthusiastically, and went at once under the fuselage. He turned the tap of the petrol

tank, and for a while surveyed the thin stream of petrol flowing from it.

"Yes, a near thing," he said softly; then he turned to us and explained: "The engine stopped owing to the petrol being short. Lvovich lay at my feet and worked the dregs up with the pump."

Schmidt came up. He embraced Golovin, and warmly congratulated the brave pilot and his crew—the first Soviet citizens to visit the region of the North Pole. Golovin willingly, but briefly, replied to questions. He was obviously very much exhausted by flying for eleven hours continuously, on top of a night without sleep.

Golovin's Story

After a rest, Golovin over tea told us the details of his outstanding flight.

"After passing over the winter station," he said, "I laid the course due North. Immediately over Rudolf Land I fell in with three layers of ragged cloud. I began to make height. Practically all through the flight I piloted the machine by the sun, controlling the results by the signals from the wireless beacon on Rudolf Land. We heard these signals up to the very end of the journey and we flew back by them too. Volkov, my navigating officer, calculated the drift of the 'plane caused by the wind, and made some corrections in the course. From time to time he pushed his head through to me in the cockpit and passed me the messages about the progress of the flight which he had written out. I glanced them over and passed them to Kekushev, he passed them on to Terentiev, and he to Stromilov. The latter relayed them to the ether. It was a complicated route!

"The strip of clear water which encircled Rudolf Land came to an end very soon. Beyond that came broken ice,

then fields of pack-ice with wide channels. At the 84th parallel we met the first real pack-ice of many years standing. More and more frequently we began to find vast unbroken fields. Even from a height of 4,500 feet it was possible to distinguish square blocks of ice in the fissures. This was evidence of its great thickness. The surface of the ice became more uniform in colour and was covered with a thick layer of snow. We met vast ice-floes, on which, in case of need, it would have been possible to land a whole armada of heavy aeroplanes.

"Icebergs were encountered only at the beginning of the flight, then they disappeared. There were no signs of land—we strained and strained for a sight of it, but none was to be seen. You can understand how much we wanted to find land! How splendid it would have been to discover land in this region!

"The aeroplane flew smoothly, without any pitching. The speed ranged from 100 to 120 miles an hour.

"The clouds ended. We passed the 83rd, 84th, 85th parallels. We were in regions where no Soviet aeroplanes had as yet ever flown, but it seemed as if we were carrying out a normal ice survey somewhere near the mouth of the Yenisei. We could hardly feel the wind. It was warm—only 10 to 12° of frost.

"When we had cut across the 85th parallel, I noticed high feathery clouds on our left, which continued during the next hundred and fifty miles. The wind was steady the whole time—about 70 miles an hour. The engines were working splendidly, and I kept on with confidence. At 88° North the port motor suddenly stopped. I instinctively selected a place to land, and was just intending to come down, when the motor again began to work normally. It appeared that in switching over from one tank to the other, the petrol supply had been interrupted for a little. It

was only afterwards that I realised that this occurrence had not frightened me. Thinking it over I decided that I had not had time, it was all over so soon.

"At the 88th parallel we struck a wall of cloud. I decided to discover how far it extended and its character. At this time we were flying at about 6,000 feet. We rose above the cloud. At first there were gaps through it, then they disappeared. The aeroplane was flying over a dense sea of cloud, with no gaps at all. So we flew on to the 89th parallel. At that moment, Kekushev pulled my collar and handed me a note from the wireless operator: Shevelev suggested we should fly to a height, look round and turn back.

"I asked Kekushev in a note:

"'How much petrol is left?'

"It appeared there was a little more than half left. All right. Then I sent a note to Volkov: How many miles left to the Pole? He replied: Sixty.

"'Well, then,' I decided, 'we'll fly it! After all, it is not so often that men come to these parts!'

"We went on with the flight. Soon Volkov rose in his seat and began excitedly waving his arms. I understood: the Pole! I looked down. There was the spot about which humanity had so long dreamed. Below us a wavy shroud of white clouds extended evenly, without a single gap. The sun was shining; the thermometer registered – 29°, and the altimeter 5,400 feet. Everything was just ordinary.

"I sent a wireless message to Schmidt about having reached the Pole, turned round, and made for home with full throttle. I very much wanted to do a few circles over the Pole, but could not spare the petrol. Stromilov and Terentiev threw down into the clouds an oil-cup on which they had scratched the name of our aeroplane and the date. There was enough oil in the cup to lubricate, just once, the rusty axis of the earth.

"The return flight was carried out in the same conditions. At 88° the clouds came to an end. Below us stretched once more ice-fields intersected by channels. We flew by the sun, and then by the signals from the Rudolf Land beacon, which was functioning excellently. Sometimes it would shut down the signals and transmit wireless messages to us. In general, we did not at any time lose communication with land.

"We left parallel after parallel behind. And then we began to get uneasy: would the petrol hold out? Kekushev began to look more and more frequently at the petrol gauge. We heard from Rudolf Land that the aerodrome and the island were covered with clouds. Below us great channels of clear water began to appear. Kekushev anxiously began to pull the collapsible boat nearer to the hatch in case it might be necessary to come down on the water. Terentiev pulled out two cases of provisions.

"Seventy miles from Rudolf Land we saw ahead of us the cloud of which we had been warned. We came closer, and unexpectedly ran out of the zone of the beacon. We changed course, trying to find the beacon again—but we could not hear it. We asked for a bearing, and they gave it to us. Then we altered course 10°.

"Of course, we could not find the island through the clouds. We came down and flew under the clouds—height, about 300 feet over the water. According to our calculations, there was very little petrol left.

"Suddenly we saw ice-covered cliffs ahead. We identified it by the chart—it was Karl Alexander Land. So Rudolf Land was on our left. I turned round at full speed and came on over the water eastwards. A few minutes later we saw the familiar outlines of the island.

"At last there was firm land under us! I saw the huts of the winter station, the bonfires and the people. Without

circling, I came full tilt to the landing-ground. Now the aeroplane was already running along the snow. The speed was lessening. The machine came to a stop on the edge of a steep slope running down to the sea. . . .

"The flight was over.

"And it was only then that for the first time I felt tired. But it was all submerged in a feeling of immense happiness and pride in the knowledge that I had fulfilled my duty to my country."

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On May 7th, at thirty minutes after midnight, Schmidt summoned a conference of commanders. Here is a journalist's record of all opinions expressed.

Schmidt: Our talks will deal with the future. Since the beginning of our flight we have all thought much and no doubt piled up many ideas. Golovin has brought back an abundance of material—his flight must play an important part in considering the concrete plan for storming the North Pole. I will now ask Ivan Timofeievich Spirin to put before the meeting the scheme which he brought to me yesterday.

Spirin: I suggest that the whole squadron should not fly together to the Pole. We must send out first one heavy aeroplane, which will make a landing as near as possible to the geographical point of the Pole, and there select and prepare an aerodrome for the rest of the aeroplanes, and it will inform us regularly about the weather. Golovin's flight has shown that our presuppositions about the weather at the Pole have been somewhat inaccurate. The same conditions, i.e., that excellent weather along the whole route may give place to clouds at the Pole, may occur again. But if we despatch the whole squadron, we must be absolutely certain of the success of the venture.

Vodopianov: I have a slightly different plan. Spirin's arguments are very good, and his idea is worth noting. But it will be very difficult to locate a 'plane at the Pole. For that reason it would be better to leave supporting bases along the route. I propose that we should land Kruze's 'plane at the 85th parallel, and Golovin's at the 88th. They will give us the weather, and when we fly past to the Pole, they will fly back.

Kruze: I agree with Vodopianov.

Golovin: So do I.

Molokov: I am against Spirin's scheme for other reasons. We don't know what conditions are like for a landing at the Pole. It is too risky to send a single 'plane. It might get damaged in landing, and we should have to go to the rescue, without knowing the exact spot where it had come down. It is a very great risk. For that reason I propose that the whole squadron should fly at the same time.

Mazuruk: I agree with Molokov. If one of the 'planes should get damaged in landing with the others standing by, we would be able to give it quick and effective help. But if it gets damaged on a flight by itself—a large-scale expedition would be needed to rescue it.

Alexeiev: The most essential point isn't clear to me yet: is it possible to make a landing at the Pole? True, Golovin saw a good many fields suitable for a landing. But Amundsen, for example, asserts in his works that it is not possible to come down at the pole. We must not abate our vigilance, but keep it up even to the verge of suspicion. When any aeroplane lands, whether scout or heavy 'plane, wireless communication will play the most important part in the operation. Only a heavy aeroplane would be able to maintain absolutely certain communication with the land. Therefore if any one 'plane is to be sent out it should be the flagship.

Babushkin: We would be able to find an aeroplane which had come down in the region of the Pole. True, it would not be easy, but it would be quite feasible. It is easier to land a heavy aeroplane on ice than other 'planes. It is more stable, the landing run is shorter, and it isn't inclined to capsize. I consider that the Papaninites should fly with the aeroplane that goes in advance. While the other 'planes are coming, they can establish their station and start scientific work.

Spirin: Excuse my speaking a second time. Golovin's and Kruze's 'planes are not equipped with reliable wireless apparatus. And this is the main thing. And, indeed, we don't need two bases. One is necessary, but it must be a base in the working of which we can have absolute confidence. It is extremely important that we should know what the weather is at the Pole. You will remember: we left Matochkin Strait when the weather was bad, but we knew then that at Rudolf Land it was fine. And so we may be able to fly from Rudolf Land in bad weather, if one of the 'planes is at the Pole and reports to us that there's bright sun there. The three 'planes will fly with open eyes. For that reason it's less risky to send one machine than to fly the whole squadron at once.

Shevelev: Who is to be sent? We must cut out Kruze from the start, as his wireless apparatus and its supply system are laid out in such a way that if the undercarriage is carried away the wireless is immediately out of action. Golovin's wireless equipment would also make the communications very doubtful. Only the apparatus of a heavy 'plane can guarantee absolutely reliable working.

Dagmarov: I vote for sending a heavy 'plane.

Schmidt: Let us fix some points that can't be disputed. There can't be any talk of the whole squadron setting out without some kind of thorough reconnaissance. It follows

that we must have the support of a fixed meteorological station on the ground (to be more exact, on the ice) near the Pole. Kruze's aeroplane has a bad wireless equipment, and, moreover, it will be wanted here at Rudolf Land to carry out current duties. It is impossible to send Golovin's 'plane further than the 88th parallel, as if we did, the petrol would not hold out for the return journey. But a heavy 'plane can be sent to the Pole itself. And in that case the value of the reconnaissance would be very considerably higher. With a heavy 'plane there is room for more qualified workers, we can give it better technical equipment, we can provide it with several months' food supplies, and a rich assortment of implements for clearing an aerodrome. Are the comrades in agreement with these conclusions?

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After a short exchange of views, the conference adopted Schmidt's proposal. Then began disputes as to which 'plane was to be sent. Each wanted to be the first to fly. The members of the expedition were people who well knew the risks of aviation work, and for whom the taking of such risks had become a profession. Schmidt put an end to the disputes. On his instructions the flagship, N–170, was selected for the flight, and Schmidt himself undertook the command of the operation. Molokov began to mutter something about the inadvisability of sending the brain of the expedition on such a risky flight. Schmidt interrupted with a laugh:

"Vasili Sergeievich is obviously exaggerating," he said. "Quite enough people will remain here capable of carrying out independently any operation however difficult. And what brain is he talking about? Look, there's Molokov—the most eminent of the eminent: there can't be anyone more eminent in the world. Wouldn't he be able to carry

out his work if the chief of the squadron was in the North? Of course he could."

And with that the proceedings ended.

On May 11th the aeroplane P–5 went out on a reconnaissance flight, with Kruze as pilot, Rubinstein navigating officer, and Dzerdzeievski as meteorological expert. The 'plane reached 85° 20′ North, and then turned back. On reaching Rudolf Land the crew found that the archipelago was covered by dense cloud. On a time reckoning Rudolf Land would soon be under them. Kruze began to come down through the cloud, but ice formed on the 'plane. He quickly jumped back again into the sun. The ice wore off, but there was no island, and the petrol was running out. The pilot decided to come down on the ice, make sure of his exact position, establish communication with Rudolf Land and then continue his flight. He slipped down again, and again ice formed on the 'plane, but he continued through the cloud until he saw the sea. A blizzard was raging down there, and the visibility was hideous. With immense difficulty Kruze succeeded in finding a suitable ice-floe, and landed on it. The landing came off satisfactorily, and the 'plane was not damaged.

Next day Rubinstein caught the sun for a few moments with his sextant. On reckoning out his position he ascertained that he had landed approximately sixty-five miles North-West of Rudolf Land. The aeroplane was on one of the ice-floes of the Arctic Ocean. This dealt the first blow to Amundsen's view—it had now been proved that it was feasible to land on an ice-floe in the central Polar basin.

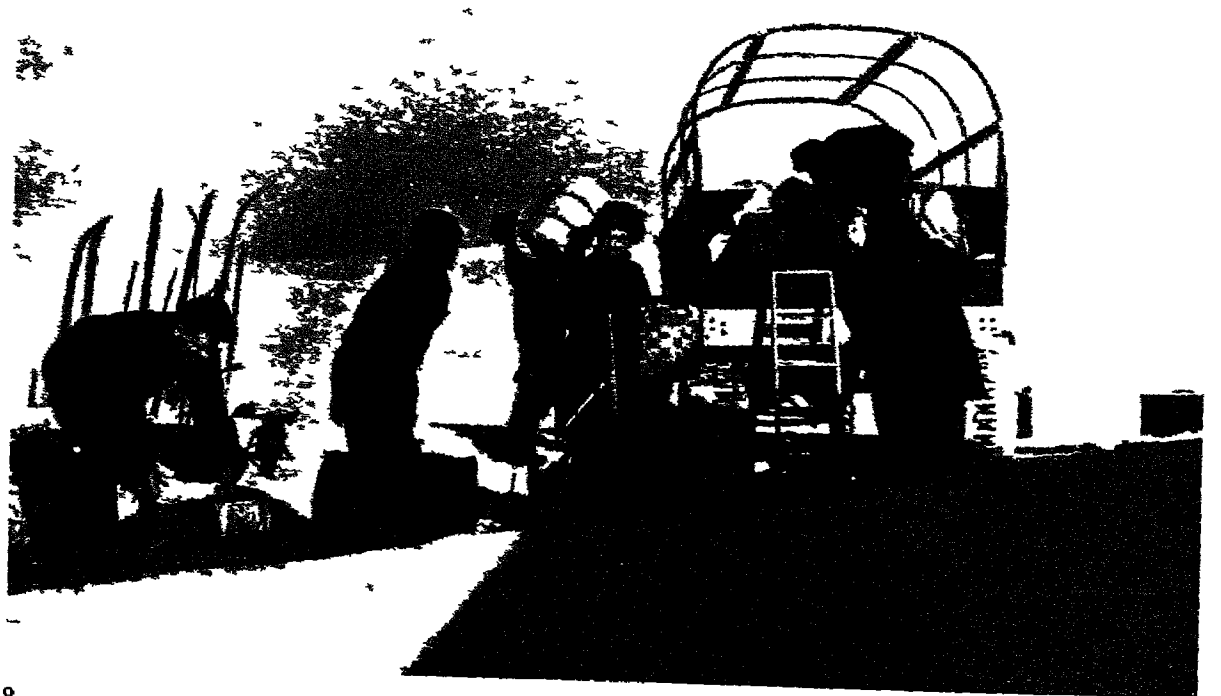
They spent seven days on this floe. From the first day, however, they established regular communication with Rudolf Land and kept us informed of all their misfortunes and needs. The blizzard raged almost all through these days. They had no warm things with them, and they were

frozen through. When they started off they had forgotten to get hold of a primus stove, and they were left without any hot food.

When he heard that they needed warm things, and particularly petrol, Shevelev ordered Golovin's plane to be immediately made ready for flying. But the blizzard raged for three days on the island, making it impossible to take off. The crew spent these three days at the aerodrome, on the look-out for any break in the canopy of the sky. It was only on the 15th that Golovin succeeded in taking off. Pilot Moshkovski—being a master-hand in parachute contests—was sent with him; his duties included dropping to his comrades on the ice-floe, by means of parachutes, petrol, food, warm things, instruments and cooking equipment. After flying for an hour and forty minutes Golovin passed low over Kruze's ice-floe. Moshkovski accurately and methodically dropped all the cargo with which he had been entrusted, and waving their hands to their friends Golovin's crew turned back.

On May 17th the weather near the ice-floe improved a little, but on the other hand the ice-floe itself began to break up. As a result of the movement of the ice a crevice appeared under the aeroplane, and water showed through near the tail. They immediately began to prepare for flight. They warmed up the engine, collected all their belongings, threw them hurriedly into the fuselage of the 'plane, and diving into a gap in the beetling clouds, got up into the air. An hour and a half later we were vigorously shaking their hands at the island aerodrome.

Here are some extracts from the diary of one of the men who took part in this first long sojourn on an ice-floe—the weather expert of the expedition, Boris Dzerdzeievski—supplemented by what Rubinstein, their navigating officer, could remember.



BEFORE THE FLIGHT TO THE NORTH POLE

Loading a lorry with the belongings of the party which was to winter on the ice

May 11th. The return flight to the island was interesting enough. For the first hour and a half we flew above the clouds. Fearing that the clouds might stretch down to the ground over the island, we decided to come down through the cloud to the sea. Not a hole or a break in the clouds could be seen. Kruze firmly turned the nose of the 'plane downwards, and at once we were enveloped in a grey, evil-smelling fog. The aeroplane began to quiver. We kept our eyes intently fixed on the arrow of the altimeter. It already showed only 300 feet, but not a thing was to be seen through the dense fog. Suddenly a black spot, like a craggy cliff, gleamed under our port wing. The pilot immediately opened full out and the aeroplane again climbed up. An encounter with land in a fog is pregnant with unpleasant consequences. Once more we came out into sunlight. But this time it did not make us at all happy. Where the island was we did not know, and we had only enough petrol left for forty minutes' flying. Kruze again dived into the cloud. The 'plane was covered with a film of ice—ice was forming on it. Fog, fog, fog. Only at 90 feet we saw an ice-floe under us. The aeroplane was flying over a channel; clouds hid the horizon, visibility was awful.

"I'll look for a place and I'll land!" Kruze shouted.

There was no proper ice-floe—it was all freshly-formed ice, covered with a network of cracks. At last we found something like a level field. Kruze came down towards the landing place; the aeroplane gently touched the surface of the ice, then it gave a gigantic leap, struck the ice again and stopped. We immediately jumped out and examined the under-carriage and the dynamo. Everything was intact. When we surveyed the surface we discovered that immediately after touching the ice we had struck a concealed block which had served us as a springboard. But for it,

we would have cut right into a high barrier of ice lying across our path. With the help of this spring-board, the aeroplane had made a sixty-foot jump, clearing the barrier. The ice-floe turned out to be fairly extensive, having been formed by the freezing together of a number of ice-fields. A wide channel wound along the side of it.

Our very first task was to establish wireless communication with Rudolf Land. But to our surprise we found that the navigating officer was the only one who understood how to work the small engine which drove the generator; but he had to remain at the transmitter. So there on the ice-floe we organised the shortest course in the world for motor mechanics. Kruze and Dzerdzeievski formed a "circle" round Rubinstein, and within fifteen minutes the navigating officer had given a lecture on the theory of motors, with practical illustrations. His pupils proved competent. As soon as the engine was running, Rubinstein gave his whole attention to the establishment of communication with the island, and the others began to unload the food and put up a tent.

We had many a curious adventure. The lack of a primus stove caused a great deal of unpleasantness. As a substitute we tried to make use of the lamp employed for warming up the engines. Rubinstein afterwards put on record: "Hostile relations were at once established between this lamp and Dzerdzeievski. When the two came in contact both began to sputter, but while Dzerdzeievski flared up, the lamp went out."

May 12th. Snow. Fog. At noon the sun peered through for a moment. We succeeded in determining our position: 82° 33′ latitude, longitude 54° 40′. We surveyed our property and ascertained that we had food supplies for a month, but petrol for only twenty minutes' flying. We could not get away without help from the island. We transmitted

regular reports on the weather, and transformed ourselves into a real mobile meteorological station.

This was Kruze's birthday; we congratulated him and drank some cognac. We kept watch in turn during the whole twenty-four hours. In the evening the weather grew worse; the wind reached a strength of 80 miles an hour and the aeroplane shook a great deal. We also shivered, as we had not taken heavy coats with us and were only in fur suits; hence we were very cold.

May 13th. In the morning the weather cleared up. The island informed us by wireless that within a couple of hours Golovin would fly out to us. But while he was in flight the weather at our ice-floe grew worse and a violent blizzard started, reducing visibility to 600 feet. Golovin turned back without finding us. However, life began to settle down into some sort of normality in our camp and we were gradually accustoming ourselves to our quarters.

May 14th. The night passed badly. We were freezing. The blizzard was raging as before, and there was a strong draught through the tent. In the morning while I was on watch I climbed into the aeroplane and dozed off; when I opened my eyes I saw a bear moving away from us. When I jumped down the bear ran off. The tracks showed that it had come right up to the tail of the machine. I was very much ashamed of myself. Rubinstein consoled me by saying: "Don't worry, Boris Lvovich—it was only an uncultured bear that you saw. As a rule, a bear should approach from down the wind, and you would have seen it then. But this bear evidently didn't know the rule and approached from the opposite direction. How can you be blamed for that?"

May 15th. Yesterday evening we had magnificent weather. I sent a wireless message to Schmidt, advising him to fly North and not worry about us. But he was unable to start

as the upper part of the island was covered with fog. Instead of that they informed us that Golovin had started off for our camp. During the period that had elapsed since our landing and the first ascertainment of our position, we had drifted to the North-East and had passed a little out of the zone of the beacon as originally set. Consequently Golovin, keeping, as he would, to that zone, would pass a little to the side of us. And our small green aeroplane would be difficult to spot from the air against the background of blue ice and sea channels. This made us all the more intent in watching the horizon.

"There he goes, there he goes!" Rubinstein shouted. About fourteen miles away we saw a moving spot about 3,000 feet up. The aeroplane came nearer, but passed on one side of us. Rubinstein quickly informed Rudolf Land of what had happened, and began to listen in to the aeroplane. It was calling us. In a few seconds communication was established with Golovin's 'plane. Orders began to be given from the ice, while the 'plane manœuvred in the air. Golovin could not spot us.

"Turn right—now left. . . . So, hold her so! . . . You're over us, you're over us. . . ." The aeroplane made a sharp turn to the right. Golovin had spotted us and began to get in position for dropping parachutes. He moved off and came down to 1,200 feet, and then came straight for our floe. Then the hatch in the fuselage opened, and a dark object fell out of it. For the first few seconds it fell anyhow; then the orange dome of the parachute opened out and, sparkling in the bright sunlight, slowly brought its precious load down almost alongside of us. In three such swoops Golovin threw down to us 400 lb. of petrol, pickaxes, spades, warm clothing, a primus, and crockery —everything we had asked for. The loads that had been dropped were all lying in the same spot. Moshkovski's

calculations—he had carried out the operation—were beyond reproach. With a farewell greeting (shaking his wings) Golovin set his course for Rudolf Land, and immediately the weather began to change for the worse.

We were thankful that now we could get ourselves away with our own resources. As I came out of the tent, I saw not far away a bear—perhaps the same illiterate one. I fired: it jumped and began to run away. We fired another two shots from behind and rushed after it. It disappeared behind some ice blocks. Tracks covered with blood ended at a channel in the ice. This meant that the bear had gone under. What a pity!

May 16th. A blizzard raged all day. The temperature was −9. It was cold and unpleasant. We drank cocoa, ate pemmican, and kept in touch with Rudolf Land.

May 17th. To-day the ice began pressing up. Our floe kept grinding; a crack showed under the aeroplane, and water came through. We would have to take to our heels. We filled the tanks with petrol and began to warm up the engines. We cleared the surface for a run, and took off at 18.25. An hour later we had landed at Rudolf Land.

IV

THE POLE CONQUERED

OUR LONG WAIT for better weather at last bore fruit. On the morning of May 20th the wind veered to the North-West, bringing a light frost. The sun broke through the clouds. During the day Moshkovski and Dzerdzeievski took off for the routine height observation of the atmosphere.

"The horizon is so wide that it makes your eyes ache," Moshkovski reported on landing.

It was thereupon decided to send out Kruze's aeroplane for a long-distance reconnoitring flight. The whole crowd drove to the hill-top aerodrome and the flagship USSR N–170 was made ready for the start. The previous day's snowstorm had left all machines covered with an unbroken layer of thin ice. This ice had to be removed—scraped out of innumerable grooves with steel scrapers. It was the devil of a job and terribly boring. It was then that we really sensed the enormous size of our aeroplanes. The removal of the ice from the flagship took us about six hours. When evening came, it was beautifully clean and new as if it had just come out of the factory gates.

Night came. It was a restless night, that night before the start of the flagship. Traffic on the road from the winter station to the aerodrome was very brisk. People rode to and fro on tank lorries, tractors and dogsledges. The aeroplane "U–2" was ceaselessly plying between the two points. This was perhaps the shortest air line in the world. It was opened by Vodopianov who brought along

Schmidt in his machine, then supper for the members of the expedition and finally the cook. Vodopianov was followed by Mazuruk, Mazuruk by Moshkovski and Moshkovski by Kozlov. They carried men, equipment, spare parts, wireless messages, weather reports. Only Molokov looked rather doubtfully at the training aeroplane. Someone suggested that he should go up in her, but he categorically refused.

"I have never flown in such a machine and don't know how to do so!" he replied.

The tiny headquarters-hut of the aerodrome was crowded. Schmidt stood near the window with his hand on the sill and looked thoughtfully out into the distance. Molokov sat smoking on the bench. Vodopianov was drying his fur stockings in front of the stove. Spirin was giving the navigating officers details of the plan for the flight of the other 'planes.

"Well, fly off as soon as possible!" Shevelev said as he came into the hut.

"Yes, it seems we can start soon now," Schmidt replied.

"And when are we to take off?" Molokov asked.

"We will have a look round and let you know. Then you are to take off. Possibly we shall not be able to land at the Pole itself. In that case we must choose a place as near the Pole as practicable. Finally, we may capsize. . . ."

"Even if we do, they'll have to fly, anyway," Vodopianov said with a laugh.

"Yes, but in that case the nature of the operation would change," Schmidt replied. "They would have to rescue us, and therefore they would have to throw out Papanin's cargo."

"Why?" Shevelev interrupted. "We would simply pour away part of our petrol, and use yours at the Pole. Pretty good, that, eh?"

Everybody laughed.

"To the machine!" Babushkin said, coming in. We all went out to the flying-field. The engines were already running, and two tractors were pulling the flagship to the starting point. Vodopianov raised his hand. The crew took their places. Thirteen men were to go: Schmidt, Vodopianov, Babushkin, Spirin, Bassein, Morozov, Pitenin, Ivanov, Papanin, Krenkel, Shirshov, Feodorov and Troianovski. We bade those who were going a warm farewell.

"See you to-morrow!"—they shouted, and shook hands.

The tractors moved off; Vodopianov opened his throttle and the machine taxied to the start. "Will we or won't we rise?" each member of the expedition asked himself. Gathering speed, Vodopianov steered his machine downhill; the 'plane ran faster and faster and at last rose into the air. It soared higher and higher, circled and disappeared to the north.

"Hurrah!" A cheer rose from the field.

The flagship was on its way to the Pole.

Having seen it off, we went back to bed. But no one could sleep. All of us were wondering how they were flying, what they were seeing, what conditions were like for their bold venture. Giving up all hope of sleep we gathered around the wireless hut and waited tensely for messages from the aeroplane. The messages were not very frequent but they were very exhaustive.

At 6 a.m. the aeroplane reached 83° 7′ North. Its height was then 3,000 feet. Above the aeroplane there was a thin layer of cloud with rifts in it. Below was pack-ice, in large blocks.

At 7 a.m. the aeroplane was at 84° 25′ North and was flying above the clouds. At 8.4 a.m. the machine reached 86°; still flying above the clouds, the 'plane rose to 6,000 feet. Through rifts in the clouds they saw ice-fields with

many channels. A strong head-wind was blowing. Temperature 28° below zero.

At 10.34 the aeroplane reached 89° North. Navigating officer Spirin and Feodorov, the astronomer, were continuously measuring the height of the sun and thus determining the position of the 'plane.

At 11.12 a.m. Stromilov began to take down a wireless message from the flagship. He managed to get only "No. 34–1 . . ." when the communication broke off. However attentively the wireless operators listened in to the ether, however eagerly they went through the whole range of their receiving sets, they got no further signals of any kind. The flagship was completely silent. Obviously something had gone wrong.

We were all feeling uneasy. The weather became worse. A fog came up. Clouds. Snow. The members of the expedition made the most varied suppositions. Perhaps the 'plane had crashed on landing? Perhaps it had developed engine trouble in the air? Perhaps it had caught fire? The most sinister thoughts came into our minds.

Moscow was pressing sharply and insistently, demanding exact information: Where was the flagship? What were we doing? When did we propose to start for the Pole? All our machines were standing ready, but the weather had definitely changed for the worse and there was no point in starting out. It would merely have meant a crash at the take off. And besides: where were we to fly to? It would be almost hopeless to look for an aeroplane in the Polar basin without knowing its exact position.

Dogmarov, the Party organiser of the expedition, received an angry enquiry from the Northern Sea Route Commission: Why had he, Dogmarov, not dissuaded Schmidt from flying? Dogmarov paced up and down the winter station and asked

everybody in a tone of despair: "How could I have dissuaded him? As if he would have listened to me!"

Ten hours passed in terrible suspense. But suddenly the whole winter station was shaken by a wild shriek from Stromilov:

"Mine! Mine! Mine!" We all rushed into the wireless hut. Stromilov was waving his arms and repeating this same word over and over again. It was only after some little time that we gathered that he had at last heard and recognised signals from Krenkel's wireless transmitter, which he had made with his own hands.

"They have landed, the devils!" Stromilov roared and bent over the receiver. The hut was crowded to capacity. All the members of the expedition had gathered in the one tiny room.

Moshkovski leant over the wireless operator's shoulder and read out in a whisper every word of Krenkel's message. Ernst had wirelessed:

"88 Kolia [this means 'love and kisses' in the private code of wireless operators] stop all alive aeroplane intact stop Simon's generator burnt out and my batteries run down stop if connection breaks off call us midnight stop will give official message."

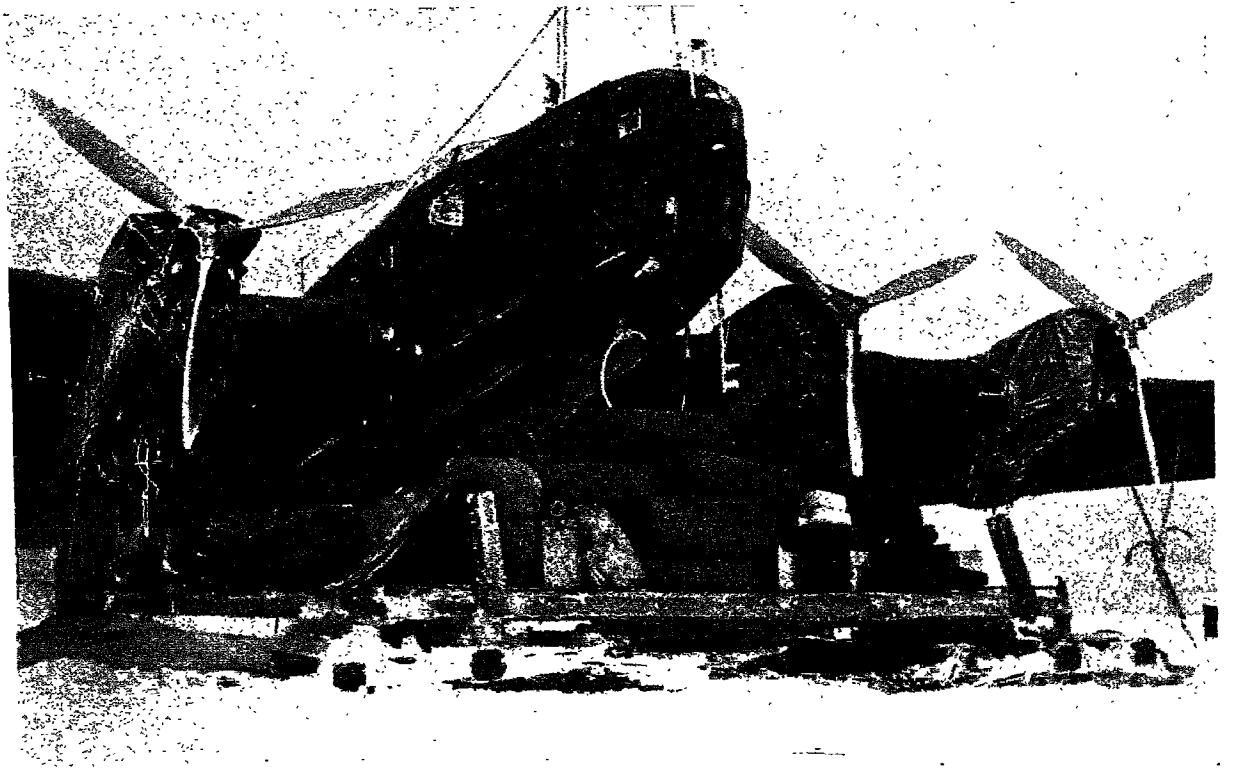
A minute later Krenkel rapped out:

"Otto Yulievich still writing stop words of his message count yourself I have no time stop we landed at 11.35 successfully stop after farewell message Simon's apparatus gave out I quickly opened up but accumulators ran down stop ice marvellous exclamation mark here is service message No. 1."

Then followed the wireless message No. 1 from the North Pole, which flew round the whole earth.

"Moscow Northern Sea Route Commission.

"Rudolf Land. for Shevelev.



9 EQUIPMENT FOR THE WINTER CAMP ON THE ICE, BEFORE BEING LOADED ON TO THE 'PLANE

"At 11.10 a.m. aeroplane USSR N–170 piloted by Vodopianov Babushkin Spirin, senior mechanic Bassein, flew over North Pole stop to make sure flew a little further stop then Vodopianov came down from 5,000 feet to 600 comma breaking through dense cloud began looking floe for landing and setting up scientific station stop at 11.35 Vodopianov made brilliant landing stop unfortunately while sending message that Pole reached sudden short circuit occurred stop radio transformer burnt through comma wireless communication ceased comma could only now be renewed after establishment of radio transformer on new Polar station stop ice-floe on which we are stationed lies about 20 kilometres beyond Pole in that direction and a little West of the Rudolf meridian stop will ascertain exact position stop ice-floe quite suitable for scientific station remaining in drift at centre of Polar basin stop possible make fine aerodrome here to take other 'planes with station cargo stop we realize that by breaking connection we involuntarily caused you much anxiety very sorry stop hearty greetings stop please report to Party and Government that first part of mission fulfilled stop Schmidt chief of expedition."

The wireless message was immediately transmitted to Moscow and then we all crowded in for dinner. We were in festive mood and very excited. We celebrated by drinking brandy and tossing Shevelev, Dzerdzeievski and Dogmarov in the air. We also wanted to toss Molokov, but he ran away. We went to bed at 2 a.m. but did not sleep well. One or other of us went down every now and then to the wireless hut to see whether any fresh messages had come from the ice-floe.

On May 22nd at 9 a.m. the Pole wirelessed the first report on the weather at 6 a.m.: "Atmospheric pressure 761 comma temperature minus 12 comma wind westerly

from Greenwich gusty stop fog stop sun hardly showing through stop visibility one kilometre stop slight snowfall."

At our headquarters the weather was improving. The clouds imperceptibly dispersed and disappeared. Only the hilltop where our aerodrome was situated was still wrapped in a light fog. There was some idea of starting for the Pole, but after a categorical weather report from the floe which showed that there was no possibility of landing, the idea was abandoned. Dzerdzeievski drew a map with the Polar station in the centre, called it Map No. 1, triumphantly coloured it and signed it.

In the evening Shevelev called a meeting of the pilots and navigating officers. The plans for the flight to the Pole by the other aeroplanes were carefully discussed at this meeting. The job in hand was exceptionally complicated. Not only did we have to reach the Pole, but also to find, somewhere beyond it, a spot measuring about 135 feet by 75 feet. The difficulty of this task can be realised by comparing the area of the Arctic Ocean with the size of our aeroplane. It was made even more difficult by the fact that the wireless apparatus of the aeroplane had gone out of commission. It meant that the radio-compass was useless in this search: the range of Krenkel's wireless transmitter was not within the receiving wave-length of the radio-compass. The meeting worked out the main methods of getting our bearings, communication between the machines during flight, the order in which the machines were to start, and rules for the steering of each machine in the event of fog, cloud or accident.

During the day Schmidt sent a wireless message describing the life of the first Soviet citizens to reach the Pole.

"The first twenty-four hours of the Soviet polar station at the North Pole are over stop five tents have sprung up

on the drifting ice-floe alongside the aeroplane stop two wireless masts erected with aerial connecting them stop weather observation hut put up comma theodolite standing on tripod for observations of height of sun and determination of our position and its changes with ice drift stop first meteorological reports reached Moscow according to schedule and were included in general weather report considerably increasing the information required to forecast weather stop here comparatively warm bracket minus 12 degrees bracket sun small near ground stop four members wintering party with crew of USSR N–170 unloaded and unpacked part of expedition equipment brought by this aeroplane comma mainly wireless station and scientific instruments stop further 8 tons including wind motor comma twelve months' supply and emergency reserve food fuel and winter tent on board three other aeroplanes ready to start from Rudolf Land with first summer weather stop all of us feel splendid stop after twenty-four hours uninterrupted work slept our fill in warm sleeping bags stop five men of *Cheliuskin* included in present group involuntarily hark back to life on drifting ice-floe stop we have now taken revenge on the elements for the loss of the *Cheliuskin* stop pleased to report that we have been able to carry out instructions of Comrade Stalin and to set up at the Pole a stable base for scientific research and aviation stop our thoughts are with our great country stop Schmidt."

May 23rd was spent in waiting for the weather. We all came out of the building and stood for a long time with our heads thrown back scanning the heavens. The sky was overcast and uninviting. A strong East wind was blowing. The mechanics, appreciating the weather as well as our weather expert, returned from the aerodrome to the winter station. We got into touch with the Pole several

times and found that the weather there too was dull and unpleasant.

In the evening, while we were having our evening meal, the chief of the winter station came in and, calling Dogmarov aside, told him something in an excited manner. Dogmarov immediately called Shevelev and the three left the ward-room. A few minutes later they returned, joyous and triumphant. Dogmarov raised his hand and said:

"Comrades, a greeting has come from the leaders of the Party and of the Government from Comrades Stalin, Molotov, Voroshilov, Kaganovich, Kalinin, Yejov and others to the members of the expedition. Listen."

Slowly and clearly pronouncing every word, Shevelev read out:

"To the chief of the North Pole expedition Comrade O. Y. Schmidt

"To the Commander of the Flying Squadron M. V. Vodopianov

"To all members of the North Pole expedition

"The Party and the Government send hearty greetings to the courageous members of the Polar expedition to the North Pole and congratulate them on the fulfilment of the task assigned—the conquest of the North Pole.

"This victory of Soviet aviation and science is the culmination of a brilliant period of work to master the secrets of the Arctic and to obtain a knowledge of the Northern routes, so necessary for the Soviet Union.

"The first stage is past, the greatest difficulties have been overcome. We are convinced that the heroic members of the group which will stay and winter at the North Pole will fulfil with honour the task entrusted to them of making a study of the North Pole.

"Bolshevik greetings to the bold conquerors of the North Pole!"

Our cheers shook the walls of the wardroom. While the wireless operators of Rudolf Land were transmitting this message to the North Pole, we started an improvised meeting. Dogmarov, Molokov, Mazuruk, Alexeiev, Kozlov and Shevelev all made impassioned, excited speeches about the great happiness given them by this greeting and the serious responsibility this message and the confidence of the Party and the Government in every member of the expedition placed upon all of us.

In a wireless message from the Pole the Papanin group informed us that they had already begun their scientific work, studying the drift, taking astronomical observations and making weather observations four times a day.

May 24th arrived, but the situation remained unchanged. The weather was as bad at Rudolf Land as it was at the Pole. The sky was covered with an unbroken veil of clouds; the horizon was enveloped in fog and visibility was rapidly decreasing. The Pole wirelessed that the weather there was even worse: dense low cloud and a blizzard. That night we warmed up and tested the engines of all the 'planes. They were all in order.

A never-ending stream of telegrams and congratulations was pouring in for the North Pole. They were coming from every corner of the earth. Relatives and friends, scientists and aviators and Polar research workers were sending their greetings to the bold Polar experts and airmen. European and American newspapers kept up an intense bombardment. In particular the *Daily Mail*, expressing its best wishes, asked Schmidt to give a forecast of the weather for the next week. Not a bad newspaper trick!

In his routine wireless message Schmidt reported:

"An unusual picture was presented yesterday evening by the meeting of the thirteen members of the advance guard of our expedition on the Polar ice-floe comma

listening to the telegrams of greeting sent by the Party and Government being read out stop We met under the open sky in a snowstorm comma but did not feel the cold were warmed by the stirring words comma the touching solicitude of our great Stalin comma we felt the warm breath of our beloved country that had sent us out stop we are continuing our work stop have measured the thickness of the floe after boring through it stop it proved to be nine feet stop the ice-floe is secure base comma has sustained prolonged drift stop now carrying us westwards with the wind comma reckoning from the Rudolf meridian comma speed half a mile an hour stop we landed beyond the Pole comma but already by evening of the day of landing comma May 21st we were at 87 degrees western longitude 89 degrees 41 minutes latitude stop in the night of May 23 western longitude 58 degrees comma latitude 89 degrees 35 minutes stop since then position not determined owing absence of sun stop weather does not as yet permit flight here of the other aeroplanes stop Schmidt."

We now learnt a number of interesting details of the flagship's flight to the Pole. At first the weather was relatively favourable. The sun was shining. The only thing that to some extent made the flight more difficult was a gusty side and head wind blowing at about 25 miles an hour. Soon the 'plane was flying over clouds. In front another mighty bank of cloud was showing. The upper edge of these clouds was much higher than the line of the 'plane's flight, and the lower edge reached almost down to sea-level. The sun gradually disappeared behind a veil of clouds. The audibility of the signals from the radio beacon suddenly ceased. The 'plane had to be navigated by magnetic compass and gyroscopic compass alone.

The aeroplane was flying between two layers of cloud. It rolled heavily. Approaching the 86th parallel the crew

with great pleasure saw a break in the upper layer of cloud. Soon the sun appeared for a short time. But a few minutes later the weather again became worse. The corridor between the clouds through which the flagship was proceeding gradually closed up and in a few more minutes the aeroplane was flying through clouds. It had to fly blind; the 'plane was navigated entirely by instruments. Ahead of the 'plane a scarcely noticeable brightness heralded a slight improvement in the weather. This came just as the 'plane was approaching the Pole. At this point the 'plane flew in a clear sky but the whole Polar region was covered with dense clouds.

At 10.50 a.m. the aeroplane reached the North Pole. Careful calculations made by Spirin confirmed the position. Spirin came up to Schmidt and reported that the goal had been reached. "Schmidt was visibly moved," Spirin later told us. "I asked for permission to fly on beyond the Pole on the same course for ten minutes. Schmidt agreed and the 'plane continued on its course."

At 11.2 a.m. Vodopianov turned the machine and brought it down, into the clouds. In another three minutes it had passed through the bank of cloud, and the thirteen men saw below them ice-fields with intersecting channels. Schmidt suggested not to return to the Pole but to search here for a suitable floe for landing. This was decided upon and a floe soon found. After circling round twice and convincing himself from its appearance that the floe was solid, Vodopianov made a gentle, cautious landing. A hearty cheer went up, and the air was filled with shouts in honour of Stalin.

The members of the expedition embraced and kissed each other in their joy. The first to step out on to the ice of the North Pole was Schmidt, chief of the expedition. After him came the others and Papanin fired a few shots by way of a salute.

Then everyone immediately took a hand in setting up the tent for Krenkel's wireless, erecting the wireless mast and fixing the aerial. No one so much as sat down until wireless communication with Rudolf Land was established.

It was only then that we learnt that during the flight to the Pole our comrades went through several hours of great anxiety. About an hour after the aeroplane set out Bassein noticed a kind of vapour rising from the centre port engine. Assuming that it came from the exhaust pipe the mechanic decided to see what was causing it. He put his hand over the exhaust pipe, but the vapour continued to rise. Then Morozov touched the lower surface of the wing and his hand came away wet. Morozov realised that it was anti-freeze—the fluid used for cooling the engines. Obviously there was a leak somewhere. The position was very dangerous. If the anti-freeze ran out the engine would immediately stop.

The mechanics ran swiftly along the machine, and Bassein said to Schmidt:

"I must report that in an hour, perhaps even less, one of the engines will give out. We shall have to fly with only three engines running."

"Can you manage a repair?" Schmidt asked.

"Only if we land first," the mechanic replied.

Schmidt looked out of the window.

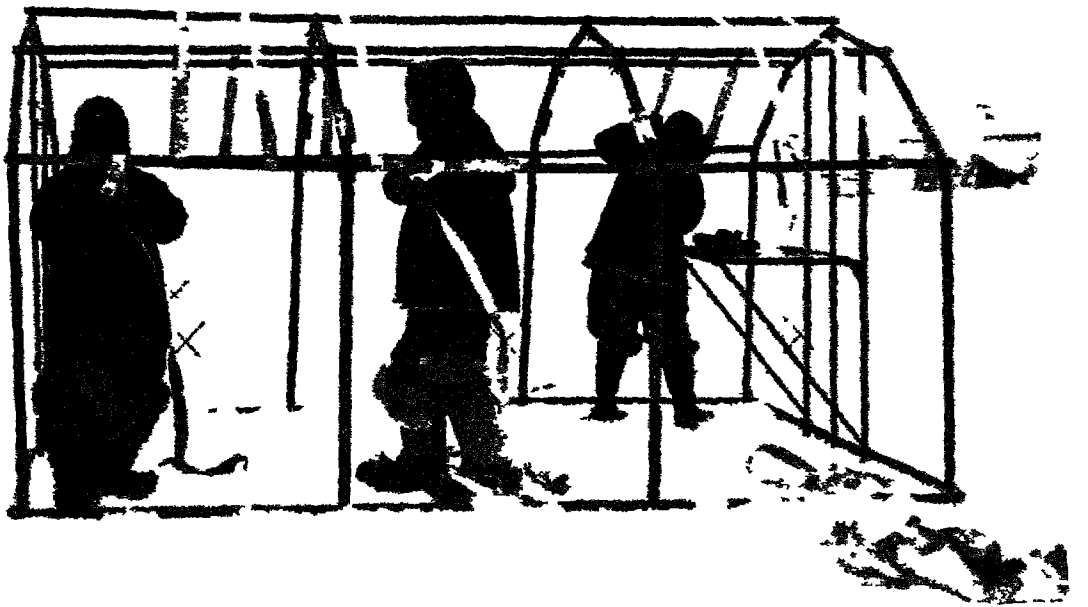
"Where can we land?" he said. "The clouds are everywhere, we can't see a thing. Let's fly as near to the Pole as we possibly can. Have you told Vodopianov?"

"No," Bassein replied. "I knew anyway that he would say, 'We'll fly with three engines, but we won't turn back'."

Schmidt laughed.

"Still, you had better report to the chief pilot."

Bassein went to Vodopianov; Schmidt watched him attentively. Vodopianov was startled by Bassein's report:



AT THE NORTH POLE

10 Assembling the framework of the main living tent of the party which was to spend the winter on the ice
Left to Right. Ivan Papanin, Ernst Krenkel, Peter Shirshov

he looked at the engines, and listened intently. The engines were running smoothly, without misfiring.

"We'll carry on, Flegont," Vodopianov said, and pointing to the clouds added: "This murk may soon come to an end, and then we can easily find a level field on which to land. Not a word to Spirin, Babushkin or Papanin's lads—why worry them?" (By the way, Spirin knew all about it and on his part had warned Bassein not to tell Vodopianov, so that the chief pilot should not be anxious.)

While this conversation was going on, Morozov and Pitenin cut through the covering of the wing and saw that there was a leak at the flange in the upper part of the radiator. They bound tape round the tube, but the fluid still came through. So they applied damp cloths, which absorbed the fluid. Then they squeezed the cloth into a pail and from the pail pumped it into the cooling system of the engine. Thus the loss of anti-freeze was very slight. This difficult operation had to be performed by the mechanics with their bare hands, putting them through the wing, at a temperature of —23°, and in the rushing wind caused by the movement of the 'plane. Though their hands were frozen and chapped till blood flowed, Bassein, Morozov and Pitenin saved the precious fluid and with it the engine itself. The mechanics continued their self-sacrificing labour until the very moment of landing at the Pole.

On the morning of May 25th the Pole wirelessed: "Marvellous weather, sun, cloudless sky, recommend you fly." But at Rudolf Land there were low-lying clouds and a wind of over 50 miles an hour. Moshkovski, sent up to reconnoitre, found that the cloud-bank was not very thick and ended at a height of 4,200 feet. Then Kruze's aeroplane was sent out for a distance reconnaissance towards the North. Kruze flew to the 84th parallel and on his return reported that the clouds ended at about 200 kilometres

from Rudolf Land and that further away the weather was clear and bright as gold.

The mechanics merrily and with great ardour set about preparing their machines for the start. By 10 p.m. everything was ready. A Northern wind was driving the clouds towards the archipelago, bringing the good weather nearer. From the hilltop we saw a gladdening golden streak in the Northern distance. But suddenly the hilltop itself was enveloped in fog. Molokov glanced towards the line of little flags flanking the runway. He could see only the two nearest ones.

"I think we must fly," he said to the other chief pilots. "We can get through somehow. It is a pity to lose good weather on the route. The rendezvous is the edge of the clouds. It is dangerous to circle over the aerodrome. We are so heavily loaded that we might smash the 'planes in manœuvring."

Each machine weighed over 24 tons. The margin of safety was cut down to the bone. We all realized that the smallest air pocket might lead to very serious consequences. The tractors hauled the aeroplanes to the starting line. The first to take off was Molokov. The distance was lost in fog, and the aeroplane ran into the unknown. Nothing could be seen ahead. We felt that we must soon reach the edge of the hill. If the machine did not gather speed in time it would fall into the sea. All the engines ran at full power. Our speed rose slowly, lazily, unwillingly. But all the same it rose. Taxi-ing along, the aeroplane finally rose only 600 feet short of the precipice. Without circling, the chief pilot steered the 'plane straight North. The machine rolled slightly.

Half an hour later the canopy of cloud came to an end. Above us stretched a blue sky, below us the sea, almost clear of ice, with only here and there a few small floes.

Here, at the edge of the clouds, we circled round, waiting for the other 'planes. In about half an hour Alexeiev dived out of the cloudbank. Seeing us, he fell into line and followed us. We were waiting for Mazuruk.

Another quarter of an hour passed, half an hour, an hour. Still no Mazuruk. We inquired by wireless of Rudolf Land: where was the third ship? The answer came: it had left thirty-five minutes after us. Where was it? We circled, using up petrol—and we had none too much of it! Should we turn back or fly to the Pole without Mazuruk? We must do one or the other, otherwise we might saw off the branch on which we were sitting—we might not have enough petrol to come back from the Pole. Having taken counsel with Shevelev, Molokov laid his course towards the North. Alexeiev followed. Mazuruk was given the order by wireless to fly northward, and on reaching the Pole to search for the camp, but if he did not find it at once to land, determine his position, establish contact and only then to fly further.

The aeroplane was crammed to capacity. It was difficult to move. The 'plane was full of the material for the group that was to winter on the ice—instruments, food, equipment, supplies. In addition we were also carrying our own reserve store of food, tents, sleeping bags, fur clothing and spare parts. Our arms—two rifles and 500 cartridges—were in a corner of the navigating officer's cabin.

We were approaching the 84th parallel, at a height of 5,400 feet and a speed of 120 miles an hour. The sun was shining brightly. Below were wide fields of ice, covered with ice-blocks and intersected by many channels and cracks. The thermometer showed 17° below zero, but in the cabin it was warm enough. We flew in fur suits but without fur overcoats. Stromilov was in constant wireless touch with Dickson, trying by every means to find out where

Mazuruk was, but Mazuruk was silent and no one knew what had become of him.

We passed the 86th parallel. A light mist lay ahead. The ice-floes for some reason grew smaller; there were more channels and many very small broken blocks of ice. All the channels were covered with a thin crust of young ice. The floes were covered with snow.

Ritsland was continually taking observations and working out calculations, making strict use of every moment. One minute he was measuring the height of the sun with his sextant, the next he was determining our drift in the wind or calculating our travelling speed. His movements were rapid but not hasty. He would stretch out his hand behind him without turning his head and unerringly he would get hold every time of the particular chart, compasses or ruler he needed. At intervals he would say to me:

"Tell Vasili Sergeievich that I would like him to fly steadily so that I can take a measurement."

When I gave Molokov such a message he flew our aeroplane as carefully as if he were holding the delicate body of a new-born infant in his hands.

Alexeiev lagged behind for some reason and Mazuruk sent a wireless message that he had passed the 85th degree of latitude and asked us to fly slower so that he could overtake us. Molokov reduced our speed by twenty miles per hour. An hour passed but still we saw no Mazuruk. Later we found out that Mazuruk had leapt forward and passed us while we were still circling at the edge of the clouds. Consequently he was flying ahead of us. While we reduced our speed he increased his in his attempt to overtake us and hence the distance between us was increasing all the time.

We were not allowed to walk about in the aeroplane during flight because that would have disturbed the balance

of the machine and compelled the pilots to use the stabilisator all the time. But the desire to find out what the others were doing during the flight to the Pole was too strong. After all one doesn't fly to the North Pole every day. I asked and received permission from Molokov, and walked along the whole length of the aeroplane. Frutetski was lying curled up into a tight knot under the petrol tank, fast asleep, tired out by the work of getting the 'plane ready. Gutovski was taking photographs all the time, using a pair of coloured spectacles as colour filters. Stromilov, capless and perspiring, was engaged in a wireless dialogue with Dickson. Shevelev did not leave him for an instant; he read the messages as they came out under the operator's pencil and answered them on the spot. Ivashina was looking after his precious motors; Molokov and Orlov were piloting the machine, while Ritsland determined our course.

How few of us there were in the enormous machine! This thought moved me strangely. Nine men flying over the icy waste, their aeroplane a mere grain of sand in comparison. And yet, and this moved me no less, these men were calm and confident in the mighty power of their own skill.

Our latitude was now 88° 30'. Below us lay an endless expanse of ice fields. Some of the floes were as big as the whole of Moscow. There were few cracks and practically no open leads. The ice-fields were covered with snow and sparkled in the sun with dazzling brilliance. Ritsland tried to find Krenkel's wireless station with the radio-compass, but in vain. He ruefully switched it off and returned to his usual instrument. Shevelev came up to me.

"Look out of the window," he said to me. "You might get a sight of the aeroplane."

I strained my eyes to the utmost but saw no aeroplane, though I often imagined that I saw the body of the machine

darkling in the distance. But I found it was an illusion every time. What I saw was either a block of ice, a crack or a hole in the ice.

By this time it was 5.52 p.m.

"We are just over the Pole," Ritsland said to me as he walked past me. He drew back the lid of the upper hatch and after a glance at the solar compass changed our course.

The North Pole did not differ in any way from the surrounding area. There were the same vast ice-fields with their veining of cracks, the same smooth blanket of snow, the same blocks of ice at the edges of the floes. Our height was 5,000 feet, and the temperature —12°. There was nothing special about it. I was thinking how I would describe the external appearance of the North Pole to my readers, and reflected sadly that there was really nothing to describe.

Piloted by Molokov and navigated by Ritsland, our aeroplane flew along the meridian on which the Schmidt camp was situated. A few minutes later Molokov handed over to Orlov and rushed into the navigating cabin.

"Alexei, look!" he shouted, holding out a pair of binoculars. "The camp!"

Ahead of us along our course we saw a little black spot. Ritsland looked at it with incredulity for a long time.

"Wait and see," he said in a non-committal tone. "Of course the camp should be on this meridian. . . . But somehow it seems to me a little too close to schedule."

However, the next minute Shevelev rushed into the cabin, threw his arms round the neck of our startled navigating officer, kissed him warmly and shouted in his joy:

"Alioshka, you devil! You've done it! And yet it's easier to win a lottery than to find that camp."

Meanwhile the camp had become visible to the naked eye. Against the white field of snow, the clean lines of the aeroplane, the little spots that were tents and the moving dots that were human beings stood out sharply. In one corner of the field there was a large "T". The wind played with the black smoke from a rocket. Molokov circled over the ice-floe, looked down and said doubtfully:

"They want us to land with the wind because the aerodrome is longer in that direction. But the wind might drive me onto Vodopianov's machine. I had better land across the width of the aerodrome and risk my own machine only."

With immense caution Molokov steered the aeroplane towards the snow-covered expanse and gently landed on the improvised aerodrome of the North Pole. After running a short distance along the ice, the aeroplane suddenly made a gigantic leap. Our right runner had come up against a huge block of ice invisible to us from above. Shevelev ran to the window in alarm.

"It's nothing, the runner has done its job and no damage has been done," he said with a sigh of relief.

A few seconds more and our aeroplane came to a stop. We were at the North Pole.

V

ON THE TOP OF THE WORLD

May 26th—the first day at the Pole

So we were at the North Pole. Through the port-hole I saw Schmidt, with youthful agility, running towards the aeroplane, with Vodopianov, Babushkin and Papanin. We lined up along the corridor leading to the hatch; Vasili Sergeievich Molokov, commander of the aeroplane, was nearest to the door. Such is the unwritten usage of the air: the captain is the first to land. Our friends rushed forward to embrace us, shake us warmly by the hand and congratulate us.

"How splendid that you've reached us, Vasili Sergeievich," Schmidt said. "The fact that you flew straight here and located us so precisely confirms our position better than any document. We could be found only by passing exactly *over the Pole. Your navigating officer is a fine fellow!*"

Aliosha Ritsland heard the last few words and quickly withdrew to a safe distance. The look in his eyes was at once timid and fierce, like that of a bear-cub. This remarkable man was terribly afraid of praise. When anyone singled him out, he bristled all over and seemed prepared to defend himself to the last breath.

"Yes, we circled round the Pole as if it were a telegraph pole," Molokov rejoined.

Accompanied by the hospitable hosts of this locality we inspected the icy site of the future winter station. The place was impressive enough. On a wide ice-field edged with

heavy pack-ice stood two enormous aeroplanes. Beside them several multi-coloured tents crouched low on the ground, with the heaped-up equipment for the drifting station.

Papanin impatiently dragged us into his tent. He found seats for the whole crew on cans of food, and produced a bottle of brandy from somewhere under his coat. More substantial refreshment was also ready: having seen our aeroplane from afar, Papanin had started his paraffin stove and fried an enormous dish of sausages.

Otto Yulievich came in.

"Here's to the heroes of the Soviet Union!" he said, raising his aluminium cup. "Here's to your brilliant flight, Vasili Sergeievich."

We all drank and ate. Molokov returned thanks for everything and then motioned his crew to the door with a movement of his head. "You seem to have forgotten the machine," he said reproachfully. "Come on, let's cover it up as quickly as possible."

We covered up the engines with warm wrappings. Papanin's four came with us and began to unload the aeroplane. The cans of food, the tubes of the winter tent, the components of the wind-driven electric station, the wireless equipment. . . . We were surprised at the quantity of things that had found room in the interior of our aeroplane. Scattered throughout the tremendous area of the machine they had not seemed so much. Now they formed a heap several yards high.

"A regular warehouseful!" Frutetski said, with obviously increased respect for the possibilities of his aeroplane.

It was already 10 a.m. We were desperately sleepy, and could hardly move our hands with fatigue. But where were the other aeroplanes? Not a word or sign of them. Stromilov and Ivanov would not leave their receiving sets, but could hear nothing. However, Alexeiev was soon found.

It appeared that on reaching the Pole he decided to land immediately, considering that whilst there was very little prospect of his finding the camp, there was the certainty that he would burn a great deal of petrol. Choosing a suitable ice-floe, Alexeiev landed as calmly and accurately as if he were landing at the Central Aerodrome in Moscow. Jukov, with deliberation and care, determined their position, and then called up Stromilov by wireless. Stromilov answered. Jukov informed the camp that they were all right and that they had just begun to clear a runway for taking off again: as soon as it was ready, the N–172 would join the squadron.

(Anticipating a little, it may be noted that Alexeiev landed nearer to the Pole than any of the others. Jukov's observation showed that they were only four miles to the West of the geometrical point of the Pole.)

Now that we were no longer anxious about our friends, we decided to take a rest. The weather had grown worse: the sky was covered with clouds, and a snow-storm began. We pitched our tent under the wing of the aeroplane, and surrounded it with a bulwark of snow lumps to protect it from the wind. The tent seemed tiny, but when we crept in we immediately saw that there was ample room for four inside it. We inflated the rubber mattresses with a pump, covered them with reindeer skins and put the sleeping bags on top. At first we got into the bags fully dressed in fur suits, taking off only our fur boots. However, Schmidt looked into our tent and laughed at us for being such greenhorns in the Arctic.

"A sleeping bag," he explained, "is a house with you yourself as the stove. Until you heat the sleeping-bag it will not keep you warm. Therefore you should keep on only your underwear. Or even better, sleep naked, though it's unpleasant to strip in the cold."

We obeyed our seniors who had grown wise with

experience, submissively stripped to our underclothes and, shivering with cold, slipped into our bags. The shivering lasted only two or three minutes. Soon it was warm and wonderfully cosy inside the bag. We felt in the seventh heaven. The bags proved of excellent quality; they were made of young reindeer hide covered with baize. Inside each bag was a lining of wool. A special flap could be pulled over to cover the head and shoulders.

Sleeping in these bags was extraordinarily pleasant. Many of the members of the expedition knew what they were doing when, on their return to Rudolf Land, they gave up their cots in the living-room and moved into tents. This decision was influenced to a considerable extent by the quality of the tents themselves. Made of silk, with double walls and a retractable entrance, they gave excellent protection from the wind while giving us plenty of the marvellous fresh Arctic air. Only the light inside the tents was somewhat unusual. The walls were of pink silk, so that our portable houses were always in a coquettish pink half-light like the boudoirs of French duchesses described with such gusto by Alexander Dumas.

The worst part of tent life is getting up. Oh, what a wrench it is to crawl out of the warm sleeping-bag! At first ordinary Primus cooking stoves were in a corner of each tent. After long disputes someone at last would muster courage, put his hands out of his bag and light the Primus. In two or three minutes the tent began to get warm and the others got out of their bags. But in time we all got hardened and could dispense with the Primus.

May 27th—the second day at the Pole

We woke at "dawn" reckoned according to Moscow time. Of course, as everyone knows, there is no local time at the

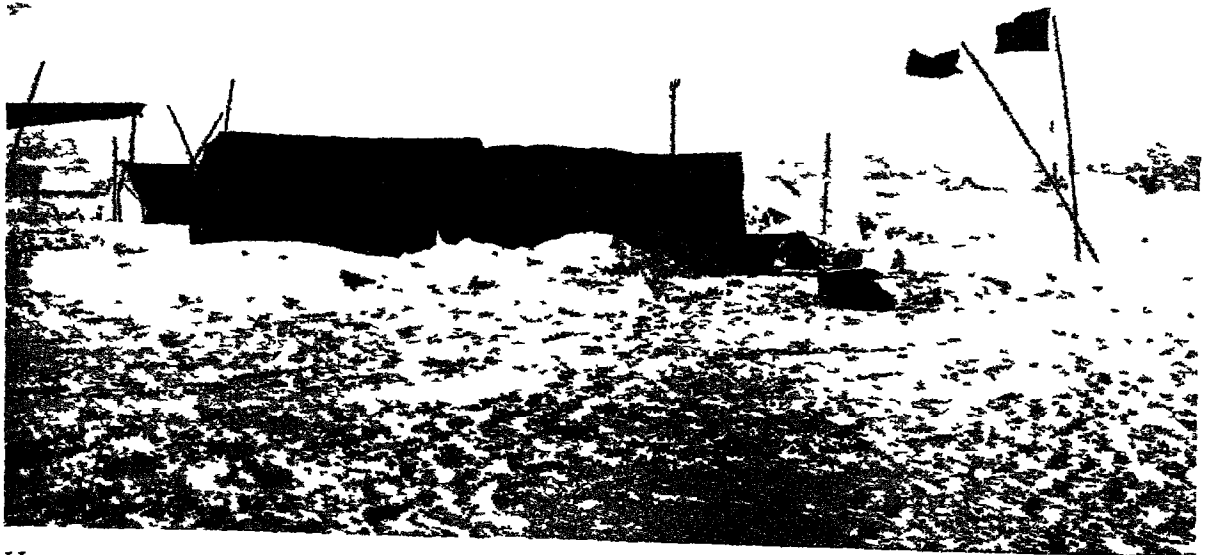
Pole. Orlov and Gutovski prepared a magnificent meal—chicken-giblets, soup, minced pork, and tea with lemon. At Rudolf Land we had loaded the food stocks of the Papanin group. Papanin had ordered so much that the storage space was hardly sufficient to hold them. But now everyone was complimenting Papanin on his foresight.

The only thing we were short of was bread. On leaving Rudolf Land we took with us a few loaves of bread for each aeroplane. It turned out that prudent Ivashina, when still at Narian-Mar, had stowed five huge rye loaves away in the wings, where they had frozen and kept very well. All we had to do was to thaw them and we had on the table (a flat anti-freeze can), covered with a clean cover off the emergency engine, a fresh loaf with an appetising odour. However, for all our thriftiness, the bread could not be made to last longer than five or six days, after which we had to eat biscuits.

After this morning dinner, we quietly and without hurry smoked a cigarette each. We never had any trouble with our tobacco supplies; during the whole flight the members of the expedition smoked excellent "Java" cigarettes. Then Molokov suggested that we should organise a fatigue party to clean the aeroplane of all dirt and snow. For three hours we crawled all over the ship, cleaning and shining. Then we washed up all the dishes and put up a notice on the door: "Wipe your boots! No entry except for Polar dwellers!"

By the way, twenty-two people were now living at the Pole, much more than had ever flown over it or approached this place of dreams throughout the whole history of mankind.

We had brought a wind motor in our aeroplane for the camp. The Papanin group immediately started erecting it. The batteries of Krenkel's wireless were very low, and



II

AT THE NORTH POLE

General view of the main living tent of the party wintering on the ice

Ernst wanted to restore their efficiency as soon as possible. Of course the Papanin group did not work alone. They issued a call, and the members of the expedition gathered from every point of the camp. Papanin lined us up, made us number off from the right and form twos. He issued pickaxes and crowbars to the first section, and shovels to the second. The erection of the wind motor proved a laborious business. Of course it was quite a simple matter to stick the thing in the snow—but it was quite another thing to anchor it. We began to make holes in the ice for anchors. For this purpose we first dug a trench in the three-feet snow covering the ice. The snow was firm, packed down almost to the hardness of ice, and we hewed it out with axes. Having dug down to the ice, we made two deep holes in it and connected these by a passage under the ice. The result was a bridge of ice, to which we fastened steel cables and then mercilessly filled up the holes again with snow and ice chips. We put down three cables in this manner, the whole job taking six hours of uninterrupted labour. Then we erected the wind motor in only fifteen minutes.

The wind was very weak, hardly perceptible. But the broad sails of the motor immediately began to turn. The control lamp lit up. Our electric station was in operation. Previous to our arrival the Papanin group had built a wireless hut for Krenkel out of snow blocks, covering it with parachute cloth. It was light and quiet in the hut. On the table (made of snow) Krenkel set up his wireless apparatus and batteries. Hardly had the wind motor begun to revolve when Krenkel made a hole through the snow wall of his hut, carried his wires through it and immediately began to charge his batteries. The wind motor conscientiously filled them with energy.

Two days had gone by and still there was no word of Mazuruk. No one knew where he was or what had happened

to him. Not only our wireless operators but all wireless stations of the whole Western Arctic were continuously searching the ether for him, but in vain. We were anxious about his fate. Mazuruk was a past-master of flying, but then so many things can happen to an aeroplane in the centre of the Arctic! . . . Shevelev practically never slept, spending all his time at the wireless apparatus of the aeroplanes.

We were working on the central plot, clearing a site for the winter tent of the Papanin group, when suddenly a wild shout rent the air. We all turned round, to see Shevelev dancing like a madman round the runners of our 'plane. We understood: Mazuruk had been found! We all rushed to the aeroplane. Our surmise was correct: Dickson wirelessed that signals from Mazuruk had been received at Cape Cheliuskin. The aeroplane was all right and so was the crew; they would give their position when the sun came out. What a relief this piece of news was to all of us!

Stromilov was in regular contact with Jukov. The navigating officer of Alexeiev's aeroplane informed us that the weather there was bad but that they would join us as soon as it improved sufficiently. During the day the wind subsided, a break appeared in the clouds, and the temperature rose—to −8°. Alexeiev wirelessed that he was preparing to take off. We waited anxiously. We marked out the aerodrome with flags. Orlov and Bassein laid out the landing "T" signal with sleeping bags. At 4 p.m. we all caught sight of the approaching aeroplane. It was flying considerably to the right of us. We called it by wireless, and it turned towards us. Alexeiev cautiously circled round a few times, carefully examined the aerodrome and only then landed. His landing was perfect.

We embraced our comrades. There were now twenty-nine persons in the Soviet camp at the North Pole. The

population was increasing at an unprecedented rate. In two days we had had an increase of about 130 per cent.! Hastily greeting his friends, Jukov put on skis and inspected our ice-floe. On his return he said with satisfaction:

"Our floe was better than yours, more even." Then he added politely: "But yours is more solid."

It had taken them only twenty-three minutes to fly to us. They had spent thirty-three hours on their ice-floe. Vilenski, the special correspondent of *Isvestia* described these thirty-three hours:

". . . When we stepped out of the aeroplane a strange feeling came over us. We were at the North Pole. But we were to some extent disappointed. The ice-floe did not betray its respectable geographical standing in any way. It was just an ordinary ice-floe, pretty large and covered with snow so solid that the runners hardly left traces on it. It was also quiet, absolutely quiet. The air was calm. Neither the voice of birds, nor the sound of footsteps, nor human speech, nor even the grinding of the ice broke this silence, which in some way was quite overwhelming. After seven hours of the roaring of our propellers this silence made a strangely intense impression on us.

"Ginkin, one of the mechanics, opened a porthole and began to throw out the covers. Schmandin, the other mechanic, caught them as they fell. Senior mechanic Konstantin Sugrobov took charge of the instruments. Jukov began to take an observation. And suddenly there was noise. The romantic glamour of the first moment vanished. Work had begun.

"Alexeiev was not to be found near the aeroplane. Habitually calm and always very thoughtful, he was not the man to waste time. His tall, slim figure showed up dark almost at the pack-ice barrier which surrounded the ice-

floe on every side. For a long time he walked round, counting his paces and observing everything keenly. On his return he announced:

"'The floe is good. We may be able to take off without additional work.'

"So we made camp on the ice-floe at the North Pole. There were seven of us: Alexeiev, Moshkovski, Jukov, Sugrobov, Ginkin, Schmandin and myself. We settled down on the floe just as we had settled down at Matochkin Strait or Rudolf Land. We covered up the engines. We lit the Primus and melted some snow. We washed and cleaned our teeth. We made entries in our diaries. Three hours went by. The second hour for taking observations had come. Jukov, as usual, took them with great care and accuracy, and declared:

"'We are four miles from the Pole. The camp is at most half an hour's flight from here.'

"Alexeiev said nothing. Jukov went and called the men together. Then he gave Shevelev our position. But it was impossible to fly. The weather had become worse. Sugrobov was fussing about near the runners with a grim expression on his face.

"'What is wrong, Konstantin Nikolaevich?'

"'This is too bad!' Sugrobov replied quickly as if hurrying to pour out the anger which was choking him. 'What's the good of landing four miles—just think of it—four whole miles from the Pole? As if we could not have landed on the very spot!'

"'Of course we couldn't! Don't you see that while Jukov was determining our position as we were flying, we had already put a certain distance between ourselves and the Pole. Also, the ice-floes at the Pole itself might have been unsuitable for a landing. From the scientific point of view four miles make no difference at all. From the geographic

standpoint such a distance is a microscopic magnitude. Further, we may well have landed on the Pole and the drift may have carried us away from it in the meantime.' Patiently, with a hardly concealed smile, Alexeiev thus attempted to console the disappointed Sugrobov.

"'Do you think we drifted away?' Sugrobov asked.

"Alexeiev looked away—the ice-floe could not have drifted four miles in three hours—and said:

"'Perhaps we did . . .'

"The hours flew fast, as if they were minutes. Sugrobov and Moshkovski went to bed. Alexeiev also took a nap. The Primus roared merrily. The wind moaned outside the metal walls of the aeroplane. But Jukov did not sleep. Something had gone wrong with his wireless, and patiently, with a plan and voltameter in his hand, he checked up the complicated apparatus, examining step by step and inch by inch every circuit, every contact, every valve, every component. He worked for four hours, and the sweat came out on his high forehead. Alexeiev woke up and joined Jukov, helping him to take the apparatus to pieces. Both realised perfectly how supremely important the wireless was for us at that moment. Without it we might search for the camp for years and never find it.

"'Got it!' Jukov said at last. 'Here it is!'

"And he smiled. The trouble was located and immediately put right.

"Fifteen hours passed. Our mechanics Ginkin and Schmandin had already slept twelve hours on end. We had our meal without them, thinking it a pity to disturb their rest. Pea soup, fried game sausages and tea with chocolate was most *recherché* fare. The saucepan and frying pan were wrapped in furs to keep the food warm until the mechanics woke up. An hour later they were up and asking for food.

"The snowstorm was beginning to subside. The wind swept the clouds away and drove the fog before it. The sun shone on our ice-floe. Jukov rapped the table with a key:

"'The weather has improved. In two hours the engines will be ready. We will let you know when we are to start.'

"The great Primuses began to roar. Seven men busied themselves round the engines, preparing them for the last stage of our flight. Exactly two hours later Jukov again called up the camp:

"'Give us the position. We are starting.'

"The aeroplane moved off easily. Taxi-ing smoothly round the field, it turned against the wind. With the throttle full open the machine then rushed along, bumping over mounds of snow and ice. The speedometer needle showed 35, 45, 55 miles an hour. Not enough! The speed must reach over 60 miles before the machine can rise. The gas was cut off, but it was already too late. It had seemed to us that the pack-ice was far away but in reality we were right upon it. With a steep upward leap the aeroplane jumped the mound of ice and its whole twenty-four tons of weight crashed on to the snow. But it had not lost inertia, and the machine made two more leaps. We thought it would be smashed to pieces. Everything was rattling, pails and Primuses, tin cans and instruments. It seemed as if the under-carriage had already carried away and the machine was sliding on its belly. But when it came to a stop and we got out, we saw that everything was all right. Alexeiev twice attempted to take off after this, but the aerodrome was obviously too short and the aeroplane could not gather the necessary speed.

"We took to the shovels, pickaxes and trenching tools. Schmandin, Ginkin and Moshkovski hacked savagely at the lumps of blue ice and hurled them aside. Sugrobov cut off the end of a plank and split it into sticks. I tore up a

piece of sheeting. Thus the first equipment of our aerodrome came into being: eight little flags. We set them up some sixty or eighty yards apart. Along them was the runway. Between the seventh and eighth flags Alexeiev was to cut off the gas if the machine did not rise. Ahead of the eighth flag were holes in the ice.

"The aeroplane taxied along, circling a group of holes. The wings prevented us from seeing ahead through the little window in front. I counted the flags. Third, fourth, fifth, sixth. The aeroplane ran along, gathering speed. Seventh. Now he ought to close the throttle. Had Alexeiev forgotten? But when we passed the eighth flag we were already in the air. Alexeiev felt that another thirty or forty yards would lift the machine. So he risked it and did not close the throttle at the eighth flag. Twenty-three minutes later we reached the camp."

Our talk was interrupted by Papanin. He came up to Alexeiev and found out from him where everything was stowed away; then he proceeded to unload the stores. The property of the station grew and grew in quantity. New heaps of food, fuel and equipment appeared on the ice-floe. Papanin prowled around with a notebook, entering every item and checking the goods on his list.

Without further delay the members of the winter party set about erecting their tent. They screwed together the aluminium tubes, connected them up with silk tape and laid down the plywood floor.

Having ended a hard day's work we all went to bed. Perfect silence reigned in the camp. The midnight sun that never set threw an even light on the vast ice-floe. The snow sparkled and was transfused with a thousand fires. Everyone slept, and the silence was broken only by the noise of the wireless transmitters: the wireless operators were searching for Mazuruk.

May 28th—the third day at the Pole

We lost all consciousness of time. It was light all the twenty-four hours; whatever the time, the sun was always at the same height, there was neither East nor West nor North. Everywhere, in all directions, on all sides, there was only South. Often when we woke up we would wonder: is it 4 a.m. or p.m.? Our problem was solved by Feodorov, who had a twenty-four hour chronometer in his tent. We applied to him to settle what time of day or night it was.

To-day the party which was to spend the winter on the ice at last finished the assembling of their tent. We christened it "Government House". In comparison with our tents theirs was a palace—lofty, spacious, perhaps even beautiful. It boasted real beds, a real table and real chairs. A portrait of Stalin hung on the wall. The floor was covered with rubber mattresses and a triple layer of reindeer skins. An electric lamp was suspended from the ceiling. Having decided that they wanted to live in a cultured way, the winter party built a snow kitchen adjacent to the tent.

"Government House" stood in the middle of the floe, the other twelve structures of the settlement being grouped around it. First came the tent in which Schmidt lived with Vodopianov, Spirin and Babushkin. Further off was the dwelling of Alexeiev, Moshkovski, Vilenski and Troianovski. The tents housing the stores and workshops were grouped in close formation round Krenkel's wireless station, which was built of snow. The rest of the tents were set up under the wings of the aeroplanes. At first Molokov and Shevelev had pitched theirs near Schmidt. But later they thought it inconvenient to have to cross the whole field several times a day for meals (the crew of each aeroplane messed on board their own machine). So Molokov and Shevelev took the reserve tent from the wing of their 'plane

and pitched it near the door leading into the machine. Ritsland and I also moved to this tent.

During the day a fresh wind brought a snowstorm and icy sleet. We all took shelter in the aeroplanes and turned them into social clubs. While we waited for the weather to improve we exchanged reminiscences of the various stages of our flight.

In each aeroplane there was a great hunt for books. There were very few to be found. At Rudolf Land we had mercilessly thrown out everything except Papanin's goods. Molokov discovered a copy of Goncharov's *Ravine*, presented to him by the Pioneers at a Moscow school. A waiting-list was immediately drawn up, of those who wished to read this book while Molokov was sleeping. He had scarcely closed his eyes before Bassein dragged the precious booty to his tent.

Yesterday evening Spirin made another observation of the camp's position. We were at 89° 14′ North, 40° West. The aeroplanes were still on the far side of the Pole, in the other hemisphere. Moving towards the South we should in theory get into the Danish sector. But of course this description is not really accurate. Only the islands and the dry land of this sector belong to any one State, while the waters beyond the ten-mile coastal limit are regarded as non-territorial. But ice is not water. And now the lawyers are scrutinising every imaginable law and regulation to determine whether ice is to be classed as *terra firma* or as ocean deep.

One English newspaper wirelessed this question to O. Schmidt: to whom in his opinion did the North Pole belong? The inquiry was the subject of a lengthy debate in the tents of our camp. Schmidt laughingly summed up our discussions in these terms (though he did not broadcast his résumé to the world at large):

"The English say that the sea belongs to the nation which has the strongest navy. We can say that the North Pole belongs to the nation which has the strongest air fleet."

May 29th—the fourth day at the Pole

We settled down and got used to Polar life. We all established a definite routine, and each crew even developed its own tradition.

"How quickly human beings adapt themselves to circumstances!" Vodopianov remarked. "It seems as if we have been living here for ages."

Each man was busy with his own job. The Papanin group worked unceasingly to improve their station, while taking observations all the time. The mechanics were digging into the engines, glad of every trifling fault which saved them from being idle. The navigating officers put their logs into a state of ideal perfection. Schmidt worked out the mathematical theory of ice-drift.

Our appetite at breakfast was usually excellent. We had pea soup, chicken cutlets and cocoa. Molokov jokingly recommended worse cooking as we should then eat less. The Papanin group hauled their stuff on sledges to form three basic stores, with the idea that if a sudden crack in the ice swallowed up one of them, two would still be left.

Dickson gave us the position of Mazuruk, with whom we still had no direct contact. Our commanding staff decided to send out an aeroplane to search for him and Molokov readily agreed to go. He worked out every detail. Shevelev would fly with us. Moshkovski and Ginkin were to come as well—they were the most observant of the whole section.

"Vasili Sergeievich, shall we take tents and sleeping bags?"

"Of course! And don't forget rifles and ammunition. We are flying in the Arctic!"

We also took some of Papanin's canned food for all eventualities, warming lamps, engine covers, snow-shoes, skis and sledges. Spirin gave Ritsland Mazuruk's last position: latitude 89° 30′, longitude 105° West.

We taxied along at great speed and took off easily. Ritsland determined the course and Molokov piloted the machine. Shevelev, Moshkovski and Ginkin were in the navigating cabin, Gutovski and myself in the middle of the fuselage at the portholes, and Ivashina and Frutetski in the mechanic's cabin. We were all equipped with binoculars. The ice shone unbearably, and our eyes hurt with the glare. We felt as if sand had been sprinkled under our eyelids. In the field of vision of our binoculars we saw innumerable suspect dots, dashes and blots. Shevelev moved from one to the other of us, checking up on our hopeful exclamations and damping our hopes each time.

Below us lay vast ice-fields criss-crossed by cracks. By degrees the floes ran smaller and the open leads wider. It was strange to see the great difference in the ice within such a comparatively small space. To the left of us rose a wall of fog. The sun became obscured by clouds, and the pilots were compelled to use their gyroscopic instruments instead of the sun compass.

After flying on a straight course for about sixty miles, Molokov turned to the right. There was no sign of an aeroplane although Ritsland had laid the course of our machine precisely towards the point indicated. Stromilov was keeping up uninterrupted wireless connection both with the camp and with Dickson, in addition to listening-in to practically the entire globe. After a short while Molokov again turned the machine, this time back towards the camp. Our course thus formed a triangle with the supposed position of Mazuruk for its centre. However, there was no Mazuruk either in the centre or along the sides of the triangle. The

position co-ordinates were evidently inaccurate. Molokov expressed his belief that the aeroplane might be somewhere in the fog to our left but it was, of course, quite useless to try and search for it there.

We caught sight of the camp from a distance of about twenty miles, and soon were flying right over it. Molokov was getting into position for landing, and Stromilov was winding in his aerial when this wireless message came through: "Hallo, Hallo RK [Mazuruk's call signal] calling am working on wave-length 625 metres stop everything all right with us stop can hear messages of RM [Molokov's call signal] stop will send message 8 p.m."

Eureka! A quarter of an hour before the specified time Stromilov sat down at his receiver. Ivanov on the flagship, Jukov on the N–172, and Krenkel in his hut were also listening-in. At 8 p.m. sharp Stromilov shouted:

"It's coming! Get the transmitter ready."

Shevelev ran up the ladder like lightning.

"They are listening-in everywhere!" he shouted, and disappeared.

Akkuratov was sending to Dickson:

"Have received RM by telephone stop possibilities reception limited owing weakness of batteries stop please observe times stop will send 10.30 a.m. and 10 p.m. will receive 11 p.m. not longer than 10 minutes stop please give zone and bearing Rudolf 30th at 11 o'clock for 20 minutes and co-ordinates other aeroplanes on ice stop RK everything in order good health and spirits await orders from leader expedition RK."

That was good: it meant that the aeroplanes had received not only our wireless telegraph messages but our wireless telephonic call as well. Stromilov switched on his transmitter, settled down comfortably in his chair, and began to speak into the microphone:

"Calling Mazuruk aeroplane, calling Mazuruk aeroplane. Molokov machine speaking, Molokov machine speaking. All aeroplanes now in Papanin camp. In camp everything all right. Tell us the condition of your aerodrome. Give us your position. I repeat: give us your position. When do you intend to start? I now switch over to reception. I am receiving, I am receiving."

Akkuratov replied:

"Have heard you. Here everything all right. Will soon have aerodrome ready for take-off. With the first fine weather will come to join you. Please give bearing for accurate determination our position."

For half an hour our wireless operators worked at this job. First they transmitted the count usual in such cases: One, two, three, four, five, six, seven, eight, nine, ten. . . . Then they began to call the aeroplane in a somewhat different tone, less regular but also less tiring. Leaning forward close to his microphone Ivanov sang:

"RK, RK here RV speaking, here RV speaking [this was the call signal of the Vodopianov aeroplane] get your direction, get your direction, hey get your direction!"

After this the wireless operators simply sang into the microphone all the latest song-hits they could remember. Sixty miles away Akkuratov was roaring with laughter, but his wireless direction finder was working with pedantic accuracy, not at all disconcerted by the unusual character of the message. The direction finder did not care; all it asked for was the electric disturbance of the ether.

May 30th—the fifth day at the Pole

It was a marvellous day, sunny and warm. The thermometer showed 0° in the sun and −7° in the shade. All round the camp people were washing and shaving.

They washed either with snow thawed into water by the Primus stoves, or simply with snow. They shaved with safety, or with open razors. Molokov declared that he would allow no unshaven faces on his 'plane. He was prepared to make an exception only in the case of Professor Schmidt.

"The whole world has got used to his beard," Molokov explained.

In the morning Mazuruk's aeroplane gave us new position co-ordinates differing by thirty miles from the ones previously given. We were still unable to establish a regular connection with his machine. Akkuratov was unable to cope with the deficiencies of the wireless apparatus, and they had no special wireless expert with them. Mazuruk feared that he would be unable to take off alone with his heavy load. Schmidt decided to send our aeroplane to his assistance, i.e., to take part of his cargo. We made ready but the weather became very much worse and made flight impossible.

That day we suddenly heard the song of a bird. It was a little Polar sparrow. We tried to find it for a long time, searching the whole North Pole for it, but could get no glimpse of it. An endless discussion ensued. Up to the present it had been assumed that there was no life at the Pole. Shirshov expressed his belief that the bird had come with us in the wing of one of the aeroplanes. But the other members of the expedition were sceptical of the possibility of such a voyage.

"The roar of the engines would have killed it," Alexeiev said. "No, Peter Petrovich, you haven't convinced me. I still think the bird is a native. In general I am ready to believe anything now, even that there's a talkie cinema behind those ice-blocks there."

Gutovski and Orlov went for a walk to the crack in the ice. On their return they praised it to the skies, so a whole



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excursion was organised to visit it. We returned disappointed: the crack was just an ordinary crack, it looked very like a river, but you could not bathe in it, nor had it even a beach.

That evening Stromilov, while listening-in to Mazuruk, discovered that Moscow was broadcasting a concert specially for us. We all immediately rushed to the earphones. We sat in cramped positions for three hours and enjoyed the broadcast tremendously. We were deeply moved not so much by the music itself as by their kind solicitude for us. Schmidt sent a message of sincere thanks to Moscow. We all wanted our names attached, but Stromilov protested that the batteries would not stand it.

A couple of days previously while we were sitting with Schmidt in his tent, I said how much I should like to have a game of chess. Professor Schmidt jumped up, dug into his rucksack but found, to his disappointment, that he had left his pocket chessboard and men at Rudolf Land. Krenkel came to the rescue declaring that there was a chessboard somewhere in their baggage, but he would not guarantee that the board also contained chessmen—it was possible that thermometers had been packed in it instead.

For two whole days we searched for this board. We found it at last among the spare parts of the reserve emergency engine. We opened it, and found both thermometers and chessmen inside. We carefully put away the thermometers and carried the chess set in triumph to the chief of the expedition. To-day I played the first game with him. Chess fans will be glad to note that this was the first game of chess played at the Pole during the whole course of its existence. Schmidt plays a lively and interesting game and his defence is particularly good. It is accurate, careful, and well ahead of his opponent's future moves.

It was midnight when we went to bed. But I had hardly

closed my eyes when Vodopianov pulled me out of the tent by the legs, sleeping-bag and all.

"I have found an inspiration to write and want to do an article for *Pravda*," he said apologetically. "Come on, you write it down for your paper. I should have got you up sooner, but could not find you."

We got into his aeroplane and sat down in the tail. Vodopianov made tea and brought condensed milk and biscuits. We sat and concocted the article. The camp was fast asleep, and our work progressed well. Vodopianov dictated to me a remarkable story of the heroic work of the mechanics during our flagship's flight to the Pole. When we had finished our work it was about four o'clock in the morning. In his enthusiasm Vodopianov resolutely marched to the chief's tent, woke him up, and made him read the article. Professor Schmidt was pleased, so Vodopianov made our wireless operator get up and ordered him to transmit it to Dickson immediately.

Stromilov got on with the job. He transmitted the 829-word article in the phenomenally short time of forty-six minutes. Then he enquired whether they had got it all. Dickson replied that they had got it, and that there was not a single query to the sender. Next day the article was printed in *Pravda*.

May 31st—the sixth day at the Pole

In Moscow, before we set out, Sima Ivanov, the wireless officer on the flagship, had already expressed his belief that he would be able to establish direct communication between the Pole and Moscow. Now he was spending every spare minute trying to put this idea into practice, trying out things, changing them, experimenting. To-day the key of the transmitting apparatus on the flagship was

ticking without respite from early morning, and we could hear Ivanov shouting nervously into the microphone. Ivanov and Dickson were rehearsing the relaying of a telephone conversation between the North Pole and Moscow.

At 8 p.m. the wireless operator rushed into Schmidt's tent and reported in great excitement:

"Otto Yulievich, we can begin!"

"All right, carry on."

Ivanov called up Dickson by telephone. The traditional phrases followed: "Hallo! Hallo! Can you hear? Tune in: one, two, three, four, five, six, seven."

At Dickson Harbour a snowstorm was raging and a seventy mile-an-hour gale was blowing. The blizzard caused disturbance and made conversation difficult. But the wireless operators stubbornly kept on pulling their signals through the ether. Dickson finally announced that everything was working and that they were hearing both Moscow and the North Pole equally well.

"Give us Moscow," Ivanov said with unexpected calm, as if it had been usual for him to talk to Moscow several times a day from the North Pole. Dickson switched us on to Moscow and relayed the transmission. For the first time the North Pole spoke to Moscow. A human voice carried across the wild open spaces which only a few days before had seemed inaccessible; and across the Arctic Ocean, over sea, tundra, and the forests of the North, Moscow answered.

Here is the verbatim report of this strange dialogue.

Moscow: Moscow Wireless Centre of the Northern Sea Route Commission speaking. Tune in. Count: one, two, three, four, five. . . .

North Pole: Hallo! Hallo! Wireless station RV. Vodopianov's aeroplane USSRN–170 speaking. Tune in. Count: one, two, three, four. . . .

Moscow: North Pole! North Pole! Moscow speaking. We hear you well, volume of sound excellent, but not clear enough. Count again, tune in: one, two, three. . . .

North Pole: Hallo! Hallo! North Pole speaking. Moscow, your indistinct reception seems to be due to the noise of our transmitter motor. We are now taking the microphone out of the cabin on to the ice and will recommence transmission at 23.15. Signify agreement.

Moscow: Hallo! Hallo! RV. We can hear you very well. We agree to your proposal. We shall resume transmission at 23.15. We are looking forward impatiently to conversation with you.

North Pole: Hallo! Hallo! North Pole speaking, wireless station Vodopianov aeroplane. It is 23.35. Moscow time. Tune in. Count: one, two, three. . . .

Moscow: Hallo, RV! We hear you well. We are receiving without relay from Dickson wireless station. We are speaking direct to the North Pole.

North Pole: We are delighted to have established direct connection. Shevelev speaking this end. Who is at the microphone in Moscow? We now change over to reception. Reception. Reception.

Moscow: I am commissioned to transmit greetings to the heroic members of the North Pole expedition. Do your best to improve wireless communication with Moscow. This will be one more achievement in your brilliant work. We should like to know whether you are in touch with Mazuruk and also what his further plans are. A hearty greeting to Otto Yulievich Schmidt and to all members of the expedition. Your work is the focus of attention not only of our own country but of all progressive men and women throughout the world. The Press of all countries is full of news about your expedition.

North Pole: Hallo, Moscow! RV speaking. Schmidt this end. We thank you for your greeting. We are in touch with Mazuruk. We are all infinitely happy to have been able to justify the confidence placed in us by Comrade Stalin, the Party and the Government. The interest which our splendid country takes in us starts mighty waves which are reaching us here at the Pole, warming our hearts. We are deeply moved by the appreciation of our work. We shall do our best to complete successfully the task entrusted to us.

Moscow: Otto Yulievich, I seize the opportunity of once again congratulating you and your companions on the successful arrival of the expedition. It is a great pleasure to convey to you greetings from your families, who are in good health. It is very cold in Moscow. The Muscovites are saying jokingly that Schmidt has opened the gates of the North Pole and that is why it is so cold in Moscow.

North Pole: Molokov speaking. Thank you for the greetings. The members of the expedition have done what was their duty. If they hadn't, there would have been no point in sending us on this expedition. Our best regards, we shall soon be seeing you.

Moscow: We shall be very pleased to see you and are impatiently looking forward to it.

North Pole: Vodopianov speaking. Greetings to Moscow. We are impatient to see the capital again. We have grown used to the Pole and feel quite at home. By the way, we should be glad to get another job in the Arctic. Here it is warm. We are playing preference and winning all Schmidt's money.

This was the end of the test conversation with Moscow. The messages were transmitted on a wave-length of 33 metres.

To-day the Papanin crew finished building the kitchen, which is almost as large as the living tent. It contains everything a kitchen in a well-equipped house should have. There are snow cupboards built into the walls and all the well-washed crockery is tidily arranged on shelves. In the corner stand a broom and a pail. The paraffin stove is roaring cheerfully. There are two burners on the stove; one is cooking "borsch" soup and the other a chicken stew. The bill of fare for the five days of the week hangs on the cupboard. It had been worked out while we were still in Moscow, with the active participation of the experts of the "Institute of Public Nutrition". Here it is:

First day: Breakfast: coffee, caviare, omelette *nature*, white meat biscuits. Lunch: borsch soup with smoked pork, meat cutlets with peas, stewed fruit, rye rusks. Tea: tea with vitamin sweetmeats, bacon, meat biscuits. Supper: *bœuf Stroganov* with potatoes, rice pudding, chocolate, meat biscuits.

Second day: Breakfast: cheese, butter, potted meat, chocolate, meat biscuits. Lunch: barley soup, smoked pork with potato *purée*, bilberry jelly, rye biscuits. Tea: rice pudding with stewed fruit, coffee and biscuits. Supper: caviare, goulash with potatoes, tea and biscuits.

Third day: Breakfast: Vienna steak with green peas, caviare, coffee, meat biscuits. Lunch: cabbage soup, meat and rice pillaff, bread pudding with fruit, rye biscuits. Tea: omelette with smoked ham, tea with milk, biscuits with butter. Supper: chicken cutlets with potato *purée*, noodles, cocoa, meat biscuits.

Fourth day: Breakfast: rice cutlets, smoked pork, chocolate, meat biscuits. Lunch: pea soup, *bœuf Stroganov*, bilberry jelly, rye biscuits. Tea: omelette *nature*, tea, chocolate, chicken paste and biscuits. Supper: goulash with potatoes, baked rice pudding, stewed fruit, meat biscuits.

Fifth day: Breakfast: coffee, caviare, butter, biscuits, omelette. Lunch: borsch soup, smoked pork and peas, rice pudding, rye biscuits. Tea: cheese, biscuits, milk chocolate. Supper: meat cutlets with potatoes, bilberry jelly, tea with milk, biscuits.

The cooking of Papanin's group roused the universal admiration of the camp. We all fell over one another trying to render the Papaninites some service and so get an invitation to dinner. Of course the fare in general was the same for us as for the winter party. The raw materials were the same. But the Papaninites, having spent several winters in the Arctic, had learnt to cook very tastily. Moreover it was much nicer to "dine out" than to feed at home. Papanin was very sparing with his invitations and carefully stressed the fact that such a favour could be granted only for exceptional services.

In the beginning we jokingly tried to put the matter on a business footing. Some of the men took the joke seriously. First one mechanic then another approached Papanin with some piece of aeroplane equipment and asked tentatively:

"Mitrich, how much sausage would you give for this?"

Papanin examined the object, perhaps a bit of duraluminium tubing, very carefully, pretended that he did not want it and reluctantly said:

"I might cut off a bit of sausage an inch long for it."

The mechanics had no earthly use for his sausage. But their business instincts were outraged by the idea that even a trifle should be given away just like that, for nothing. This harmless worldliness was encouraged by the rumour that Papanin, on the day of his arrival, had given Flegont Bassein four pounds of sausage in exchange for a yard of rubber tubing. Shadows stole about from morning to night, near the tent of the winter party, negotiating in undertones. But to-day Papanin quite suddenly declared

that his food reserves were sacred, and the mechanics no less suddenly lost all interest in spare parts for him. Papanin felt the change of atmosphere and immediately went to the aeroplanes and began to unscrew and take away all sorts of tubes, taps, and brackets as if they belonged to him. The mechanics watched this raid dispassionately and with complete indifference. And yet on the mainland they would have dealt mercilessly with anyone who dared so much as lay a hand on the most unnecessary little screw of any of the machines.

Work at the station did not cease for a single instant. Our technical experts stood by the winter party like true friends, helping the Papanin quartet with all their knowledge, experience and skill. When burners of the paraffin stove in the Papanin kitchen burned through, it worried Papanin and he issued a call for help. The response was splendid—all the senior mechanics of the aeroplanes rallied to the call. As past-masters and professors of technical science they carefully examined the destruction wrought by fire and held counsel together.

"Give it to me," Sugrobov said, and took the stove away to his aeroplane. Out of what he manufactured new burners is still a secret, but the burners functioned very well during the whole time of our stay in camp, are still functioning and will no doubt continue to function faultlessly when the stove itself will have fallen to pieces with age.

To-day Sugrobov and Ginkin pottered round Krenkel's snow hut, dismantling and adjusting the emergency petrol engine which had not been assembled very well. They changed the ignition system according to their own ideas. The engine made a staccato clatter, and a dense cloud of smoke and petrol fumes poured from it. But then the smoke abated, the fumes vanished and the engine changed to a measured hum. The experts had done the trick.

That evening we decided to go for a walk before going to bed. We walked to one crack and then to another. How enchantingly beautiful it was here! The pure crystalline snow sparkled like a million diamonds. The distances were boundless, and so was the blue sky. On the virgin snow the track of the skis, the exotic colours of the tents, the sails of the wind engine, the severe outlines of the mighty aeroplanes all stood out with remarkable clearness. When we donned smoked glasses the sky immediately became dark green, and everything all round took on a fairy-like aspect and colour. And in whatever direction we turned there was boundless space, wilderness, nature in the raw.

Eternity!

June 1st—the seventh day at the Pole

To-day the Papaninites opened a fresh case of food and discovered in it a marvellous cake weighing 90 lb. On top lay a really affecting note: "Be brave, healthy and cheerful. From the factory for child nutrition."

The entire population of the Pole gathered round the box. With an enormous carving-knife Papanin cut off microscopic slices and gave each man a bit to taste, sighing persistently and pointedly at the multitude of tasters. Some of the men tried to take their places a second time in the queue round the wonderful box, but the eagle-eyed Krenkel immediately spotted the offenders and chased them away in disgrace.

It was a grey day, with a mist over the ice and low-lying clouds. A light breeze was blowing. It was comparatively warm and we walked about in fur tunics without fur coats. In general we have got used to fur clothing, and Gutovski to-day discovered with horror that he was "simply wearing four pairs of breeches", i.e. two woollen, a leather, and a fur pair. Many of us now wear leather boots instead

of fur socks, because they do not soak through so easily, and if it is cold we can run round the aeroplanes a few times in them and be sure of being warm for an hour or more.

The scope of the expedition's scientific work has widened day by day. Feodorov to-day completed the erection of the tent and instruments for his gravitation observations, and in the evening sat down to determine the force of terrestrial gravitation at the North Pole. His apparatus has roused universal rapture. It measures scraps of time not longer than one ten-millionth of a second. But in order to determine the force of gravitation, Feodorov had to remain at his instrument twenty-four hours watching the swinging pendulum.

"And when will you measure the depth?" Ritsland inquired. "Perhaps it's dangerous to sleep here, it may be deep. . ." he said in jest.

"You can sleep quietly," Shirshov reassured him. "Here the depth can't be more than two miles and a half." (He was wrong—it was about one fifth of a mile more—4,290 metres). "We shall take a sounding as soon as Mazuruk arrives. He's got the windlass."

Mazuruk sent a message to say that his aerodrome was nearing completion. He and his crew had broken down sixty-seven mounds of ice, some of which were twelve to fifteen feet high. Kozlov, Shekurov and Timofeievich smashed the ice with axes, and Dogmarov hauled the pieces away on a sledge to the edge of the aerodrome. For the last two days our comrades had been busy breaking down the central ice-mound and had now reached ground level.

The commanders of the aeroplanes and Schmidt anxiously calculated the squadron's stocks of petrol. They all reached the same conclusion: that all of us could not return to Rudolf Land. Too much fuel had been used up in flights in the Polar region. One of the machines would evidently have

to land somewhere on the way to Rudolf and then be refuelled.

In the evening Feodorov announced the results of his magnetological and meteorological observations at the Pole. On the 70th meridian the magnetic needle deviated 110° to the West of true North. The horizontal co-ordinate was five times less than in Moscow and about the same as in the region of Cape Cheliuskin. The dominant winds came from the North, North-West and West. No Southern winds had been observable up to then.

Schmidt, busy during the night, had worked out the mathematical method of determining the direction and speed of the ice-drift. Closeted with Spirin and Feodorov he asked them to verify his calculations with the greatest care. The comrades did their best, attempting in the interests of science to find a snag in the professor's intricate calculations; they introduced correctives for windage, the various currents, the climatic conditions—but after a couple of hours Schmidt came out of the tent happy: his theory had proved irrefutable.

June 2nd—the eighth day at the Pole

A blizzard, and low-lying clouds and fog, but warm—the thermometer had risen to zero. And this was supposed to be the North Pole!

"We shall have to go to the South Pole for a little cold," jested Shevelev.

Icy sleet fell. The wings of the aeroplane being warm, the sleet melted and little streams ran down the trusses. The walls of our tents were soaked and the sleeping-bags were wet. The North Pole had suddenly become uncomfortable. There was nowhere to get ourselves dry, and an air of gloom prevailed. During the day there was a slight frost and the wings of the aeroplanes were immediately

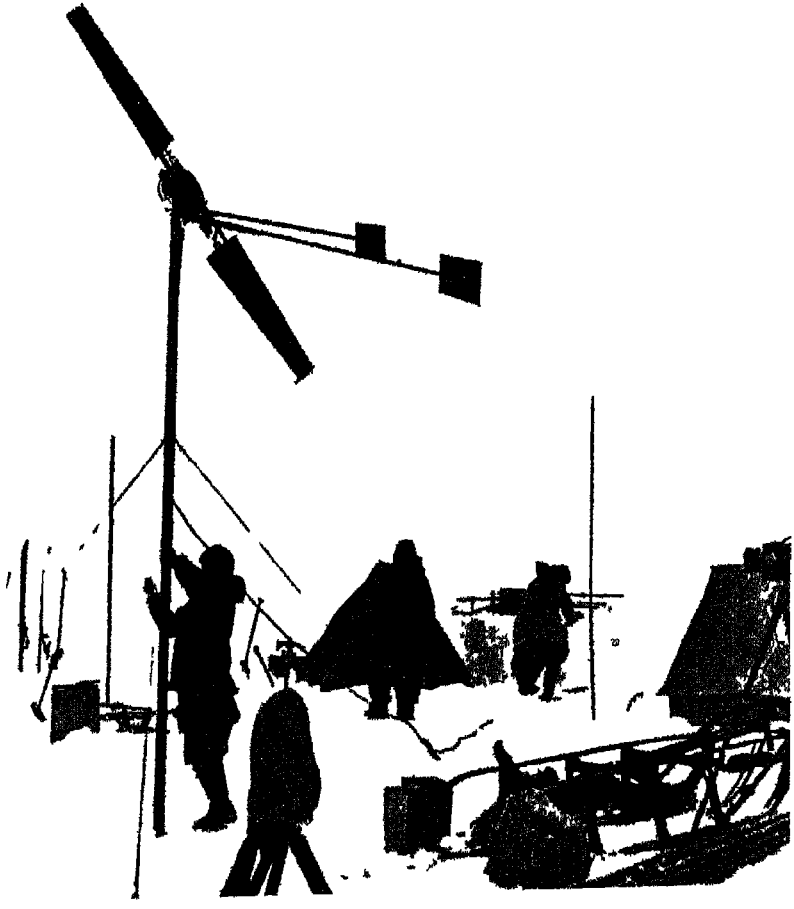
iced over. For the next few hours we were busy with chisels and gouges scraping the sheath of ice off the wings.

Feodorov to-day reconnoitred the whole floe on skis. There are cracks all round and we are on an island measuring about a mile and a half by one mile. None of us has any doubts about the stability of the ice-floe. It could hold out even against a strong pressure of ice. The pack-ice heaped up on the edges of the ice-field acts as a sort of bulwark protecting our camp from all sorts of unpleasant possibilities. The ice was so thick that Papanin confidently declared: "It would not melt even if we took it along to the Black Sea." Nevertheless, to-day he and Krenkel went off on skis towards the North, and returning a few hours later he declared with satisfaction:

"We found a fine field alongside this one. If the worst comes to the worst we can transfer our camp there."

Studying and observing the nature of the drift, Schmidt concluded that it would take the floe to the Greenland coast. This was the probable route. But it was not impossible that some cross-current might turn the whole surrounding mass of ice in some other direction which could not be foreseen. The speed of the drift was considerable, but in absolute figures it was, of course, very small. It might take the winter party until the summer of next year to reach the coast of Greenland, i.e., the 82nd or 83rd degree of latitude. They would be taken off either by aeroplane or ice-breaker, according to ice conditions.

We talked to Mazuruk several times a day. We were separated by a mere sixty miles. But we could not get together—such is the Arctic. We involuntarily thought of the camp of the Cheliuskin crew. They were only a hundred miles from the coast, but it took the aeroplanes two months to get them over to Cape Vancarem.



13

AT THE NORTH POLE
Erection of the Wind Electric Power Station

The weather was constantly playing us tricks. We could not fly to Mazuruk's assistance, although he kept insisting that we should come. Fog and low-lying clouds were the weapons used against us by the Arctic. We all remembered the uneasy days on Rudolf Land when the unfavourable weather conditions for several days prevented Golovin from flying to aid Kruze, held up so near to the island.

I made use of the comparative lull in routine wireless communications to send quite a lot of material to *Pravda* —partly written by myself, partly by other members of the expedition. We did our best to express our thoughts tersely and precisely. Our articles sometimes looked like a mere jumble of headings.

That evening, before going to bed, I strolled along to the machines. Stromilov was transmitting to Moscow innumerable private messages sent by the members of the expedition to their people—greetings, kisses, embraces. Orlov was sitting beside him writing a message.

"I am expecting a little son to be born in July," he said dreamily. "It would be good to be back in Moscow by then."

June 3rd—the ninth day at the Pole

The altimeter went under ground level. Its pointer indicated that we were 150 feet below sea-level. It was a strange feeling. We knew perfectly well that we were above sea-level, but how could we disbelieve this precise and carefully tested instrument? Jukov explained:

"The pressure increases and shifts the needle of the instrument to the left. We can expect fine weather."

Just then Shirshov rushed into the tent in great excitement and gave us a sensational piece of news. He and Feodorov had seen a water-bird fly over the big crack and along past the camp. None of the Polar explorers who had reached

latitudes near the Pole had ever observed any signs of life. They had never seen either beast or bird. The general consensus of scientific opinion was that no life existed at the Pole, that its waters and ice-fields were sterile and uninhabited. But we had already heard a bird a few days ago and now we discovered the presence of a second living creature. Papanin triumphantly promised to return to Moscow with the skin of a real Polar bear.

Life in the camp never rested a minute, although anyone would have thought that everything had already been done. The winter quarters for the Papanin group were ready in all essentials. The drifting station had been equipped and the aeroplanes unloaded. But still the indefatigable explorers found something more to be done. The mechanics inspected the mechanism of their 'planes for the tenth time. And although everything was in exemplary order, they still found something to clean, to tighten or to adjust.

The plans of the return flight were carefully discussed. Our aeroplanes were on runners, and had no spare wheels. Without wheels we could not land on the mainland. Schmidt made arrangements by wireless that an ice-breaker should be sent to meet us with the necessary wheels. Shevelev and Gutovski made the round of all the 'planes, asking what each wanted the ice-breaker to bring. The mechanics ordered a mass of all sorts of spare parts which they would probably never need in all their life, but such is the outlook of our technical staff. They want to have at their disposal every possible thing for every possible eventuality. Shevelev listened patiently to the endless list of requirements and filled whole notebooks with orders, but on returning to his own tent, he considered again whether the orders were justifiable, and in the end sent Moscow only this laconic message:

"Send four pair wheels comma eighty tons petrol comma five tons oil comma props for fitting the wheels comma

fifty summer flying suits and helmets comma newspapers comma fruit comma vegetables stop greetings Shevelev."

Mazuruk sent a message that his aerodrome had melted away owing to the warm weather. The pilot was again afraid that he would be unable to take off with his overloaded 'plane. Therefore he insistently asked that Molokov be sent with his machine to take part of the cargo.

Schmidt came to the microphone:

"We will send the aeroplane. Try and do two things: keep up regular wireless communication and find out your exact position. You have given no position data for a long while. Make use of every bit of bright weather to determine your position otherwise it will be difficult to find you."

Molokov began his preparations for the start. "How's the wind?" he asked his navigator. "Straight into the nose," Alexeiev replied. "But whether it's East or West, South or North I don't know."

Shirshov was waiting impatiently to begin his oceanographic observations. Up to the present they had been made impossible by the lack of the deep-water windlass which was with Mazuruk's aeroplane. To-day Shirshov started making a home-made windlass. He fixed a drum and line on a sledge, fitted handles, brake and meter. He was hoping to fix up the first hydrological station at the Pole on the following day. Everybody watched his preparations with great interest and helped him to the best of their ability.

To-day Schmidt removed to new quarters—into the tent formerly occupied by the Papanin group. They had invited him to join them in their "Government House", but Otto Yulievich declined the invitation, not wishing to separate from his own crew. We celebrated the occasion by drinking half a bottle of brandy and playing two games of chess.

Krenkel and Stromilov were very anxious to establish wireless communication with short-wave amateurs. They both

listened eagerly to the phrases and calls flying about in the ether from English and American amateurs, and remarked with satisfaction that our aeroplane receivers picked up short-wave calls even from distant Hawaii.

"Once the aeroplanes have gone," Krenkel said dreamily, "I shall be able to talk as much as I like with wireless amateurs all over the earth."

To-day our ice-floe passed the 89th parallel, drifting towards the South. At last the points of the compass have emerged: we have at our disposal North and West, South and East.

Our cameraman, Mark Troianovski, rushes about indefatigably all day in all these directions. The Pole, the camp, the tents, the men—to him everything is a magnificent subject for a "shot". The huge camera is always standing ready under the open sky in the centre of the camp. Troianovski himself is constantly on the move with a little hand camera, shooting without respite with an agility which fills even the hustler Papanin with envy. By the way, there seemed to be something curious in the relations between Troianovski and Papanin. The former was always on the heels of the latter, looking at him with pleading eyes, and whispering confidentially into his ear. At first, for a few days Papanin shook his head in a categorical negative. Then he began to listen more and more attentively and seemed to relent. Finally their *tête-à-têtes* ended with Troianovski securing from Papanin something like a couple of thousand feet of film. He had shot away his own allowance long ago.

June 4th—the tenth day at the Pole

Having worked all night, Shirshov had finished his home-made windlass by the morning. Of course "morning" as we said before is a very relative term in this part of the

world, for as noted previously the sun rolls along the horizon both night and day at the same height; this, of course, also happens at the South Pole.

In the early morning we harnessed ourselves to a sledge and hauled the windlass to the edge of the nearest lead. It looked like a little rustic brook with a strange and intricate course. The icy banks were about three feet above the water, and were strewn here and there with irregularly piled pack-ice. With the assistance of a few of us Troianovski rolled a few ice-blocks into the water, thus forming a flying bridge; then he crossed on it to the other bank of the lead and from there "shot" a most unusual scene.

The scene was the establishment of the first hydrological station in the North Polar region. With the air of a priest performing a ceremony, Shirshov attached the first bathymeter to the cable, read its thermometer and gave the order: "Lower away!"

Molokov was handling the cable drum. Slowly and cautiously he lowered the instrument into the ocean. The water was calm, dark blue in colour, and exceptionally transparent. The meter showed 150 feet and still we saw the gleaming nose of the bathymeter. Molokov paid out the cable yard by yard. The meter showed 300 . . . 450 . . . 600 . . . 750 feet. Our hydrologist stopped the drum and attached a second bathymeter to the cable. After another 750 feet a third and then a fourth instrument disappeared under the water. Then a "messenger" was sent hurtling down; on reaching the instrument, the "messenger" turns it over and closes it, so that the thermometer registers the temperature of the water at that level only.

After a few minutes Shirshov silently raised his hand. Molokov began to haul up again very slowly. It was hard work. There were more than 3,000 feet of steel cable in the water, and the weight was considerable. Molokov's move-

ments, at first brisk, gradually slowed down. When he had hauled up 150 feet, he said self-consciously: "Phew, how hot it is in this climate!" and readily gave up his job to Spirin. A few minutes later Spirin confirmed Molokov's description of the climatic conditions and let Ritsland take his place. After that the remark about the climate was the signal for a relief to take over the handle of the cable drum.

The first bathymeter came up to the surface from the ocean depths. Trembling with impatience Shirshov unhitched it from the line, armed himself with a magnifying glass and bending over the water began there and then to read the thermometers. He wrote down the reading of one of the thermometers with a nonplussed air, glanced at the next thermometer and exclaimed with vexation:

"How exasperating! The thermometers are out of order."

The little column of mercury said that at a depth of 900 feet the temperature of the water was +0.62° centigrade. "Impossible," Shirshov kept repeating while the second bathymeter was hauled to the surface. Its thermometers showed that the temperature of the water at a depth of 1,500 feet was +0.48° centigrade. There was no longer room for doubt. In the centre of the Arctic Ocean, at the North Pole, there was a great layer of warm water!

Thunderstruck by this most important scientific discovery, we forgot our exhaustion and worked away at the handle of the cable drum. The third bathymeter also recorded warm water. Only the fourth instrument, which had descended to a depth of 3,000 feet, brought up the record of a minus temperature. Even there the water was comparatively warm: the thermometers recorded −0.17°, while the usual temperature of Polar sea-water is between −1.6° and −2° centigrade. Opening the faucets of the bathy-

meters, our hydrologist emptied the water from each level into glass containers. The samples would later be subjected to a careful chemical analysis. In the seclusion of his tent Shirshov would determine the salt content of the water, its oxygen content and various other characteristics which would permit science to trace the exact origin of the great stream of warm water. But even then no one harboured any doubt that it was the mighty Gulf Stream that brought these warm waters to the Pole. The water warmed by the Florida sun found its way to the North Pole.

Shirshov remained at his post until evening. Again and again he lowered the bathymeters to varying depths with the object of determining the limits of the warm stream and verified the thermometer readings. Fifteen levels in all were examined. The results showed that the warm water occupied a stratum extending from a depth of 750 feet to about 1,800 feet. The warmest water was at a level of 1,200 feet, e.g. +0.77° centigrade. Above this warm water lay a layer of cold water reaching to the surface and showing a temperature of −1.63° centigrade.

We looked down at the calm, smooth surface of the ocean with undisguised respect. Not one of the world's scientists, and of course not one of us, had suspected that there was such a mighty submarine river of warm water here. Suddenly we saw something like a little fish at the edge of the ice. I bent over and tried to catch it with my hand, and nearly tumbled into the water. So we rationalised our labour: Molokov sat on my legs while I, reassured as to my fate, paddled about in the water with my hands trying to catch the object. After about ten minutes our enterprise was crowned with complete success, and the prey lay prostrate on the ice. It was a small crab about two inches long. Another theory had received a blow: the waters of the central Arctic have proved to be inhabited. That evening Shirshov

lowered plankton nets into the deep and drew out all sorts of sea-creatures, some of them microscopic, others visible to the naked eye.

The weather was not improving. The sky remained overcast. From time to time there was a fall of snow. The temperature was −3° centigrade. Mazuruk informed us that the same conditions were prevailing in his camp. We could not fly to him nor could he fly to us. So we sat on the ocean's edge, waiting for fair weather.

June 5th—the eleventh day at the Pole

Last night a break appeared in the grey clouds. This immediately livened up all the airmen. Mazuruk informed us that his aerodrome was quite ready and that the weather was improving. Schmidt, Vodopianov, Shevelev and Spirin were up all night talking by wireless telephone to the crew of the USSR N-169, giving instructions for their flight, the precise position of our drifting camp and the force and direction of the wind.

After weighing up all factors, Mazuruk announced that he would attempt to join us on his own, without lightening his 'plane by a single pound of the precious cargo destined for Papanin. A bright streak appeared on the horizon. Clear sky was coming nearer. The edge of the clouds was moving from us towards Mazuruk. Nature herself was helping us: between our camp and Mazuruk's aerodrome lay a straight air road marked out by a trail of clouds. At 5.30 a.m. Akkuratov sent the last message:

"All ready, engines warm, are taking off immediately. I am winding in my aerial. Listen to us in the air."

In our camp we were all organised in sections. Each brigade, consisting of three men, was ordered to watch through binoculars a certain sector of the sky and signal

immediately if the aeroplane came in sight. The aerodrome was marked out with red flags. Moshkovski and Orlov dashed about the field on skis, once more testing the surface of the snow. All wireless stations changed over to reception. In half an hour Akkuratov informed us that the machine was in the air and flying on its course. Jukov immediately began to work the direction-finding apparatus. All of us gazed anxiously into the cloudy horizon.

"There they are!" shouted Troianovski.

A dozen binoculars were pointed in the direction indicated. A black dot appeared in the sky, swelled to a speck, grew larger. Vodopianov lighted a smoke torch. Huge puffs of black smoke streamed across the sky. The aeroplane, which had been steering a course slightly to the right of the camp, swung round straight at us.

"Splendid!" Vodopianov said joyfully. "We shall all be together again soon."

All round us there was activity, happy faces, cheerful conversation, laughter and jokes. The acroplane came nearer and nearer. We could already hear the hum of its engines. Mazuruk came down low over the camp, circled twice and made a brilliant landing. We all rushed to the aeroplane. Enthusiastic greetings were exchanged. When the first excitement of the welcome was over, we began to examine the crew more carefully. All the comrades were in good health and looked very well. The machine, too, was in the best of order.

This is the story Mazuruk told us:

"Five hours and forty-five minutes after the start from Rudolf Land our navigating officer announced that we were over the Pole. To make doubly sure I decided to continue on my former course another ten minutes, preferring to pass on beyond the Pole rather than not reach it. Knowing the position of the camp we turned towards the left and

searched for a while but could not find it. So I selected a floe and made a successful landing. The crew got out on to the ice. We lined up, took off our hats and sang the 'International', embraced each other and planted the red flag on a high block of ice. Akkuratov immediately took an observation to determine our position. The others went off to explore the floe. They found that it was about 1,000 yards long by 700 yards wide. A ring of piled-up pack-ice framing the floe bore witness to its solidity. However, its surface was very uneven; the ice-blocks and hillocks with which it was covered prevented us from taking off again. We had to face the long and weary work of making an aerodrome. So we covered up the engines, set up our tents, got out our instruments and began our life in camp.

"We spent ten days on the floe, and each day we worked till we could work no more. The clearing of a space for an aerodrome, and the establishment of wireless communications, cost us a great deal of energy and effort. The crew was small—we were only six men in all. We had no special wireless operator and this is why we did not succeed in establishing contact with the camp during the first few days. To crown it all, the engine belt broke. We tried to make a new one out of parachute straps and sledge-traces, and even cut up the tops of a pair of swamp boots. But to our intense annoyance the straps broke again and again. In our few hours of leisure we were entertained by Dogmarov, who recited bits of 'Evgeni Onegin', and by Timofeievich, who sang arias from 'Rose-Marie' and 'The Bayadère'.

"It was none too easy to find your camp. In a space of about sixty miles we had to cross about 70°. The take-off was difficult too. However, everything went well. From above the camp looks like a huge settlement."

When he had finished his story and answered a few questions, Mazuruk went into one of the tents and

immediately went to sleep. His companions and the Papanin group began to unload the aeroplane. The first thing to come out was the famous hydrological windlass, and Shirshov immediately started putting it together. He wanted to measure the depth of the ocean as soon as possible.

The fifth member of the group that was to winter there, brought along by Mazuruk, was rushing about the floe with his tail in the air. It was the dog, "Cheery," who obviously found it all very pleasant and satisfactory.

That day Ritsland caught the famous bird we had seen before. It had approached one of the numerous empty tins to pick up any scraps left in it, and our navigating officer there and then threw a net over it. He brought the booty in triumph to our tent. Suddenly from outside we heard Papanin's angry voice:

"How dare you steal other people's fowls?"

"How dare you let your fauna sprawl all over the Pole?" Ritsland retorted in an aggrieved tone of voice, handing over the bird. Papanin shook his fist at Ritsland, took the bird and retired into his own house. The bird was installed there and the members of the expedition came in mass to admire this material proof of the existence of life at the North Pole.

To-day Schmidt convened the chief pilots of the aeroplanes in his tent to discuss the return journey.

It appeared that the petrol in the tanks was not sufficient for the return flight, and that therefore not all the machines could fly all the way back. Two solutions were proposed: to leave one machine at the Pole and fly the others to Rudolf Land; and the other: to fly all together, then land two machines at the 85th parallel and let the two others fly on to Rudolf Land. The machines which landed half-way would be refuelled from Rudolf Land as soon as summer weather set in. The chief of the expedition asked the chief pilots to express their opinion.

Alexeiev: During the flight to the Pole I observed the condition of the ice very attentively. There is a zone of good ice for landing, beginning at the 84th parallel. I consider it quite possible to land a heavy ship at the 85th parallel. I therefore oppose the plan of leaving one machine here.

Molokov: I am for a landing. Why should we abandon a perfectly good 'plane? People would never forgive us if we did that. And which chief pilot would agree to leave his 'plane at the Pole and fly back as a passenger?

Vodopianov: Landing at the 85th parallel entails a considerable amount of risk. It is one thing to land when there is a bright sun and another thing to do so in cloudy weather. The diffuse light conceals the unevenness of the ground and it would be very easy to damage the machine. I suggest that we should send Kruze with his light aeroplane from Rudolf Land to the 85th parallel. He can land easily. Let him reconnoitre the place and keep us constantly informed of weather conditions.

Babushkin: I support this proposal.

Shevelev: Yes, I think this is the correct solution.

Schmidt: We must end our expedition as successfully as we began it. No one would condemn us for leaving one machine here. Everyone would understand that it was not a light-hearted decision. But all the same, it would mean that the Arctic had partly defeated us. Our job is to prove that the Bolsheviks rule the Arctic with a sure hand and that they have won this victory without losing any of their forces. There is of course an element of risk in landing, but in what Arctic operation is there no element of risk? Is it not risky to fly to the North Pole and back over the open Barents Sea? Besides, we must remember that an aeroplane costs the Government a lot of money and we have no right to throw it away.



AT THE NORTH POLE
Building a snow kitchen

Alexeiev: I ask permission to land at the 85th parallel. You can rest assured that the aeroplane and crew will give no cause for anxiety.

Schmidt: I agree. The second machine will have to be Mazuruk's; he has less petrol than the others.

Mazuruk: Agreed.

Schmidt: Now there is a further proposal: that we all go to bed.

The meeting dispersed. Only Schmidt and Molokov remained in the tent. Molokov was unusually embarrassed in his manner, and talked about all sorts of irrelevant things. Schmidt looked at him inquiringly.

"Otto Yulievich," the chief pilot of the N-170 said at last, "the crew of Mazuruk's machine is tired out. Let me land at the 85th parallel."

"No, Vasili Sergeievich," Schmidt replied, much moved. "You must not land; we need you at Rudolf Land. It seems to me that it will be your aeroplane which will have to refuel Mazuruk."

Farewell to the North Pole

During the night of the 5th to the 6th of June the weather cleared up to some extent on the route between the North Pole and Rudolf Land. Dzerdzeievski, who had stayed behind at Rudolf Land, informed us by wireless that he was expecting a further improvement in the weather. Kruze went out to reconnoitre the 85th parallel, with instructions that he was to land and send out information by wireless at regular intervals.

"Warm up the engines!" Vodopianov's order rang out.

The last hours of our stay at the North Pole had arrived. We had not been there very long but we all felt as if we had lived at the Pole for ages. We had all become used to camp

life and grown fond of our tents, which seemed almost like long-standing houses to us; and in fact we were really feeling extremely comfortable at the North Pole. We had all become used to the restless, untiring labour and irrepressible energy of the Papanin group, and regarded it as our established duty to render them every assistance in our power. And therefore the decision that we were to go came to us all as a sudden blow. Was it possible that soon, in a couple of hours, we would be leaving these men of whom we had grown so fond? Was it possible that when Vodopianov's machine took off they would not be in their accustomed places on board?

The Papaninites themselves were also visibly moved by the imminent parting, though they attempted to conceal it and assured us proudly and independently that now at last, when we had gone, they would breathe more easily and feel they could start on their real work. Ernst Krenkel said lightly that the long-desired moment was approaching when he could exchange a few words with the wireless amateurs of America—until now our messages and newspaper articles had choked up the whole ether.

These four were remaining behind, alone on the cold ice-floe in the central Arctic basin. And however courageous they were, they naturally felt the pain of parting and some heaviness of heart.

Peter Shirshov was asleep when the decision to leave was taken. Roused by the unexpected roar of the engines he rushed out of the tent in a fur cloak hastily thrown over his sleeping attire, and ran up to Schmidt.

"Otto Yulievich," he said excitedly, "what about the measurement of the ocean depth? We wanted to lower a line to the bottom to-day for the first time."

"Never mind," Schmidt replied. "You can measure it yourself, and we shall be just as pleased to hear the results

by wireless, as we would have been if we had been here with you. We can't miss this weather!"

Papanin visited all the aeroplanes in turn. He hurriedly ran up the ladder, threw a fleeting glance over the fuselage and carefully examined the stern, where we had our kitchens —these were the object of special sympathy from Papanin. Without a word he gathered in from each ship every possible thing without which an aeroplane could still fly. Tea-kettles, pots and pans, knives and forks, canned food, cases of spare parts, tools, skis and sticks dropped fast on to the snow of the aerodrome. We readily gave the winter party the emergency reserves of the aeroplanes because we knew that we were flying back to the mainland while our comrades would have to spend long months alone on the ice.

Each chief pilot knew of course that the flight back to Rudolf Land from the North Pole was not easy, and that any one of our machines might have trouble when making a forced landing on the ice. Nevertheless we gave up our stocks without regret or selfishness because while a forced landing for us was a mere possibility, that the Papaninites were to winter on the ice was a certainty. With the same readiness the chief pilots of the aeroplanes poured out into the reserve tanks of the winter station group nearly 150 gallons of petrol, the precious blood of aeroplanes.

At last all preparations were complete. On a sunny Polar night and with a strong North wind blowing, the inhabitants of the ice-floe gathered for a ceremonial meeting devoted to the official opening of the North Pole Station. We were thirty-five men. Otto Yulievich Schmidt, using a sledge as a platform, made a short but passionate and moving speech. His words carried far over the icy expanse and an almost inaudible echo repeated them, somewhere by the aeroplanes.

"I declare this meeting open. It is being held to celebrate the completion of the work for the establishment of a

scientific station on the drifting ice of the North Pole," the chief of our expedition began. "The experience of the past few months, during which we have carried out the great and difficult piece of work entrusted to us by our country, has made a profound impression on all of us. We are happy to have fulfilled the task set us by Comrade Stalin, to have won fresh glory for our country, and to have made the name of the U.S.S.R. even more respected throughout the world. We would not have won if our Communist Party had not trained us to devotion, persistence and confidence; we would not have won if the technique of our factories had been less excellent, we would not have won if we had not had such splendid teamwork, such true unison between intellectual and manual labour. Our pilots, navigators and ingenious mechanics—the whole personnel of the expedition—are men of high intellectual ability and amazing manual skill. To-day we say farewell to the Pole —a warm farewell, for the North Pole has proved for us not terrible but hospitable and friendly, as if it had been waiting for ages to greet the Soviets and find its true masters. We are now to fly away. Four of our best comrades and friends will remain behind at the Pole. We are confident that they will keep the standard flying which we hand over to them. We are certain that their work will never be forgotten in the history of world science, and that a new page of Bolshevik victories will be written in the history of our own country. I congratulate the comrades who are remaining here on the great task entrusted to them by their country."

Papanin replied to Schmidt. He spoke jerkily, with obvious excitement:

"In the name of the four men remaining behind here, sons of our Socialist mother-country, I request Otto Yulievich to tell Comrade Stalin that we will fulfil our task with

honour, and will justify the great trust placed in us. We will never weaken our country's prestige, or lower the dignity of a Soviet citizen. You need have no anxiety for us, dear friends. Difficulties hold no terrors for us. You will leave us, but we shall not remain alone. We feel that the support of our whole country, of the whole Soviet people, remains with us. Good-bye, friends, until we meet again. Thank you for all you have done!"

The speeches were over. At a word of command from Otto Schmidt, Krenkel pulled a rope and the flag with the Soviet emblem ran up on the flagstaff. On another staff another flag with a portrait of Stalin was hoisted. Three volleys were fired from guns and pistols.

In the ensuing silence Schmidt read out in a firm, clear voice the text of a report to Stalin and Molotov:

"The establishment of the scientific station on a drifting Polar ice-floe was completed on June 6th. The station was ceremonially opened by hoisting the Soviet flag, singing the International, giving a salute and cheers for the Soviet Union and Comrade Stalin.

"Scientific work is being fully carried out according to programme. The winter party remains behind, excellently equipped for the period arranged, full of energy and proud of the confidence placed in them, they promise to fulfil the task entrusted to them by the Party and the Government.

"The aeroplanes are starting on their return flight. We know the difficulties of this journey. But the main thing is done: four Soviet aeroplanes have flown from Moscow to Rudolf Land and from there over the Arctic Ocean to the North Pole. All four aeroplanes passed over the Pole and then landed on ice-floes, came together and established and equipped a scientific station at the North Pole. A cargo of ten thousand kilograms has been brought to the Pole without a single accident or mishap on the way. All

the men are in good health. The aeroplanes, engines and the whole equipment are all of Soviet manufacture.

"For the first time operations have been carried out at the North Pole on a scale which guarantees the possibility of that thorough exploration of the heart of the Arctic of which the scientists of many countries have so long dreamed. This venture has proved to be within the powers only of a Socialist country.

"We report to the Communist Party of the Soviet Union which trained us, and to the Government of our beloved country, that we have fulfilled our task. We are infinitely happy that we are sons of our Socialist country which is marching from victory to victory under the wise leadership of Comrade Stalin. We are happy to have been commissioned to win one more victory and to have fulfilled this commission.

"For the whole collective group of the expedition: Schmidt, Vodopianov, Molokov, Papanin, Shevelev, Dogmarov."

With bared heads we sang the International, and the icy wastes of the heart of the Arctic resounded with the words of the victorious anthem of the revolution. Schmidt called for three cheers for Comrade Stalin. We all joined in with a will, and the air trembled with cheers for the man who teaches, trains, heartens and leads us on to victory.

"The meeting is closed," Schmidt said. "To the machines!"

Papanin, Krenkel, Shirshov and Feodorov handed us bulky packets of letters and photographic films, and asked us to convey dozens of hearty greetings, kisses and embraces. The four who were remaining kept with us during the last few minutes, going from aeroplane to aeroplane, from one man to the other, taking leave of all. They took a warm

and tender farewell of the chief of the expedition, the chief pilots and the whole thirty of us.

It seemed to be all over. Vodopianov was leaning out of his cabin and waving impatiently for his crew. The propellors of the other aeroplanes were already revolving. Everything had already been said.

But on the path which had been trodden from the tents to the aeroplanes stood the leader of the expedition. He glanced slowly round the whole camp, bustling with the final preparations; he looked stern and pensive. Schmidt was taking leave of the camp, of the nameless ice-floe in the central Arctic, of the North Pole. What was passing through his mind? No doubt he was reflecting that from here, from the North Pole, a dozen Polar stations would arise, created by his efforts, on the islands and coasts of the Polar basin. Along the Northern Sea Route he no doubt saw caravans of cargo ships sailing, the forerunners of yet other caravans. The whole map of the Arctic would be criss-crossed by the routes travelled by this man, whose cold, deep, analytic mind is linked with the ardent heart of a conqueror and a Bolshevik. Now he was bidding a solitary and silent farewell to the North Pole.

"Time's up!" Vodopianov shouted.

Schmidt, with a parting wave of his hand, approached Krenkel.

"Ernst Theodorovich," he said, "here is the report to the Government and Comrade Stalin. Send it off as soon as we have gone."

They embraced once again, and Schmidt went to the 'plane. Vodopianov started the engines. We all rushed to the tail of the 'plane to balance it; the engines roared, and the aeroplane trembled and moved off, slowly taxi-ing to the starting point. Then with a short run Vodopianov took off into the air.

The Papaninites stood with bared heads, looking at the soaring 'plane. Then Mazuruk zoomed up like a thunderbolt. Molokov and Alexeiev taxied to the start. Seven men were still on the ground: the four who were to stay, Gutovski, the mechanic, Troianovski, the cameraman, who was shooting his last pictures, and myself.

"Hurry up!" Molokov shouted, waving to us. We again said farewell to our friends.

"Oh," Papanin said, "do get off now! You are making me terribly sad."

We rushed to the aeroplane and heard the four shouting after us in chorus:

"Greetings to the mainland! Greetings to good old Moscow!"

From the air we saw the camp which had grown dear to us and which now looked somehow orphaned, Alexeiev's aeroplane running along the ice, and four tiny figures waving their hands. Good-bye, North Pole! The aeroplanes rose high. A light mist covered the camp and hid our comrades. The four of them were now left face to face with the Arctic Ocean. On the flagstaff the dark-red emblem of our country fluttered in the wind. . . .

It was 3.42 a.m. The squadron was well away on its course. We rapidly broke through the clouds and emerged into the sunshine and the blue infinity of the open sky. We rose higher; the aeroplanes moved restfully, as if they were floating on an Arctic Ocean of cloud.

"Hallo! Hallo! The flagship calling!" We heard Schmidt's familiar voice in our earphones. "Calling the aeroplanes of Molokov and Alexeiev. How are things with you? Please reply. Reception. Reception."

Jukov and I informed the flagship that everything was all right with us. Akkuratov gave a similar report. Through rare breaks in the clouds we saw fields of pack-ice, separated



15

AT THE NORTH POLE
A bright, sunny day

by wide channels. The carpet of cloud was marvellously beautiful. It rose and fell, and the clouds moved like the waves of a foaming sea. Troianovski, this time flying with us, took one film after another of the wonderful spectacle. Very soon he ruefully announced that he had only twenty-seven feet of film left in his camera. I sympathised but could not help. The generous uncle, Papanin, had stayed behind at the Pole.

Shevelev, flying on the aeroplane piloted by Alexeiev, asked Mazuruk by wireless to keep in constant touch with him. The squadron came lower now, flying South. The two 'planes were soon going to leave us, and it was necessary that they should act with uniformity and precision.

We steered straight for Rudolf Land. Observations showed that we were on the right course. The wind was favourable and our speed reached 140 miles an hour. That was splendid. We were flying all the time over an unbroken layer of cloud. Within the aeroplane it was warm, and the sun shone warmly. Somewhere down below us were ice-floes, pack-ice and open leads such as for centuries had served as barriers, insurmountable by all the courageous explorers who had attempted to reach the top of the world. We were flying above them, not even seeing all these obstacles. The upper layer of cloud gradually rose higher and the wind was now on our quarter instead of behind us. Our speed fell to 125 miles an hour. The altitude was 6,000 feet. The flagship communicated with Kruze by wireless and asked him for a weather report. Kruze, from the 85th parallel, where he had landed on the ice, replied that there was a cumulus stratum at an altitude of 3,600 feet.

6.6 a.m. Latitude 84° 40′. I was sitting with earphones on all the time. I heard Shevelev's precise voice saying:

"Hallo! Hallo! Flagship! N-172 calling. Shevelev speaking. The N-169 has enough petrol to last to Rudolf Land.

I have instructed it to follow you, but I will land on the ice."

"Hallo! Hallo! Flagship calling. Schmidt speaking. I understood your message. Very sorry that you must land, but your decision is absolutely correct and I approve it. Please let us know how you get on through the clouds."

"Hallo! Hallo! Mazuruk machine calling. We have 400 gallons of petrol left. We think we can make Rudolf Land."

"Hallo! Hallo! Alexeiev machine calling the flagship. You asked us to tell you how we get on through the clouds. My watch now shows 7.5. Altitude 4,200 feet. . . . We are approaching a bank of clouds. . . . Altitude 3,900 feet. . . . We have entered the cloud. . . . Altitude 3,750 feet. . . . Visibility nil. . . . Altitude 3,600. . . . Fog. . . . Altitude 3,300. . . . Still dark. . . . Altitude 2,850. . . . Below us a break in the clouds. . . . More breaks. . . ."

Jukov's voice faded out. Evidently the aeroplane had begun to circle round, searching for an aerodrome, and had thus got further away from us. We flew on towards the South. Through breaks in the clouds we saw pack-ice that filled us with anxiety. Where would Alexeiev be able to land? The squadron was crossing invisible parallels and approaching nearer and nearer to the island.

It was 8.15 a.m. Ahead of us lay Rudolf Land, covered with a cap of clouds. The aeroplanes circled over the island, but could not land, as the clouds reached right down to the ground. At last Vodopianov noticed that the wind had uncovered one of the slopes of the hill, and resolutely steered towards the slope. All the machines cautiously landed on the hill and laboriously taxied up.

The journey was over. The staff of the winter station was running to welcome us.

We were home again.

VI

THE VALIANT FOUR ON THE DRIFTING ICE-FLOE

WHO ARE THE four men who remained behind on the ice in the heart of the Arctic? Here, in brief, is what each of them told me.

Ivan Papanin, chief of the North Pole Station

I was born in Sevastopol in 1894. My father was a sailor, but later he worked in a smithy. He is now seventy-one, but his health is perhaps better than mine. After attending elementary school for four years, I had to enter an instrument-making factory and begin life on my own. I was then fourteen years old. In 1914 I was called up and was soon assigned to the navy.

The October revolution found me in the army. Together with my comrades I joined with the partisan group of Mokroussov in the campaigns against Generals Kornilov and Kaledin. In 1919 I organised an armoured train and was subsequently transferred to the South and appointed commissar of the operations department at naval staff headquarters on the South-Western front.

I think that the most interesting episode of my fighting life was my work in organising insurgent detachments in the Crimea, in the rear of Wrangel's army. For this purpose a small group was formed and one night we crossed in a small boat from Anapi to the Crimea. We landed near the village of Kapsikhor, and unloaded all our equipment,

consisting of a machine-gun, bombs, ammunition and a bulky package of Tsarist money. We got into touch with the partisans. The news of our arrival spread rapidly through all the Crimean forests, where the Tartars had taken refuge from the press-gangs and the terror of the Whites. We began to organise the small scattered detachments into a united revolutionary partisan army of the Crimea. True, we had very few weapons—but we soon found a way to remedy this. The White Guards themselves began to bring us weapons in exchange for immediate payment in Tsarist money! We did a brisk trade.

One day we found that our coffers were empty. All the money had been spent in buying machine-guns, rifles and ammunition. We had to refill our treasury and also inform our headquarters of the progress of operations. Mokroussov, who commanded the insurgent army, charged me with this mission. But how was I to get into Soviet Russia? I approached the contrabandists who were smuggling flour out of the Crimea. They agreed to help me. They hid me in a sack and loaded me on to their little boat in the guise of a sack of flour. During the night our secret ship sailed for the Turkish port of Trebizond. However, during the voyage our captain learned that flour was cheap in Trebizond, and he therefore decided to change his course to Sinop. There I went on land and walked along the Turkish coast to Trebizond. In order not to attract attention, I changed into rags, let my beard grow, and pretended to be a beggar. Begging my way, I passed from town to town, and in three weeks reached Trebizond. There I got into touch with friends, changed my clothes, shaved, and immediately sailed for Novorossiisk in a small boat. However, instead of Novorossiisk we found ourselves at Gagri, which at that time was in the hands of the Whites. They received us with machine-gun fire. Our skipper was so frightened

that he hid below. I took his place and took the boat out to sea. Soon we arrived at Novorossiisk.

After I had made my report to Frunze, commanding that front, it was decided to send another detachment to the Crimea, having reached which, they soon joined the partisans in driving the Whites from the peninsula. For my military work here I received the Order of the Red Banner.

After the end of the civil war I worked for ten years in various Soviet institutions, occupying leading positions. But my roving nature was never completely satisfied. I wanted to go away, to organise something, to travel. In 1931 the airship *Graf Zeppelin* flew from Germany to the North. This fired my imagination. With great difficulty I then managed to get permission to go to Franz Josef Land, in Pacific Bay, to take the airship's mail. This was how I first came to the Arctic. The grim North, the endless icy waste, bewitched me. The following year I went North again, this time as the head of the group that was to winter at the Polar station in Pacific Bay. We immediately started great building activities: we built a hangar for the aeroplanes, huts for scientific work, living quarters and an excellent bath-house. We spent the winter pleasantly. Our group got on well together, working harmoniously and energetically. We did a great deal of work and in the end our station was voted the best on the whole Arctic Soviet coast. During the winter we explored with dog-sledges the whole Franz Josef archipelago, consisting of about a hundred large and small islands. We were interested in the geological structure of the islands, in the magnitude of the magnetic deviation in the Arctic, in the depths of the bays, the nature of the ice and a great many other things. During these journeys we got into a tight place now and again. One day I went out with a German scientist, Dr. Scholtz, to investigate May Island. We put up our tent and began to cook our

dinner. A strong wind blew the appetising smell all over the archipelago. A hungry bear caught the scent and came along. We were already asleep when he arrived at our tent. Our rifles were outside near the sledges, because we were afraid that moisture would form on them inside the tent. The bear approached very quietly and cautiously. Even our watchdog only noticed it when the bear was right on him. The dog, scared to death, squealed piteously and raced for the sea.

The squeal woke us. Looking out of the tent, I almost collided with the bear and quickly crept back again. What was to be done? The rifles were outside. All I had was a Mauser pistol. The bear walked round and round the tent as if on sentry-go. In order to get at the rifle, his attention had to be diverted somehow. I fired my revolver, but the beast paid not the slightest attention. So the doctor and I shouted in unison as loud as we could. The bear leapt back, I rushed out into the snow, grabbed the rifle, took aim and killed the bear. The beast was so big that the two of us could hardly turn him over on his back. It must have weighed almost half a ton.

So the winter passed. Only once was our collective life nearly wrecked. In Polar stations, the cook plays a most important part. The quality of his work determines the state of mind and energy of the whole party. Our cook was a young man. He had come to the Arctic, having decided to spend a year away from his wife, in order to find out how necessary they were to one another. The Polar night came on. We all got wireless messages from home; his faithless wife was the only one who did not write. The lad was worried and when he was slicing onions in the kitchen, sliced his own fingers instead of the onions. And then a wireless message came: "Aliosha, I have come to the conclusion that our ways must part."

The wireless operator brought this message to me. What was he to do? If we let the cook have it, the whole crew

would be fed to the end of the winter with revolting food. I decided that the cause must come first, and dictated a different text to the wireless operator: "Dear beloved Aliosha, I can hardly await the minute when I see you again. Write more often, innumerable kisses."

We gave the cook this wireless message. While we were eating we heard him singing in the kitchen. While formerly he had served us with tiny Vienna steaks, he now made them so large that they protruded beyond the edge of the plates. He could hardly wait until we had finished our meal, and then rushed to the wireless operator and sent a tender reply to Leningrad. Three days later the wireless operator brought me another depressing text and I again substituted a false message. Once more the kitchen resounded with song. Finally his wife herself sent him a message telling him of her great love for him.

When we got back to Leningrad we were amazed. All our wives of course came to meet us—and like wives looked after our luggage so that it should not get lost—but the cook's wife flung herself on his neck as soon as she saw him, dragged him to a taxi and drove away, forgetting all about his luggage and everything else. We had to look after it ourselves and send his things home for him.

A year later I was appointed chief of the Polar station on Cape Cheliuskin. We built a large settlement there, carried out a full cycle of scientific observations and carefully investigated the whole region, travelling about 2,000 miles by dog-sledge. When the winter was over I began immediate preparations for the North Pole expedition.

Ernst Krenkel

My father told me that long ago, in the reign of the Empress Catherine, a Krenkel came from Thuringia to

Russia to be chief shepherd of the State flocks in the Ukraine. Later one of the Krenkels was a baker. My father was a teacher of German and Latin in Russian schools. I was born in 1903 in Bielostok. I went to school, and read a lot of adventure books. With the coming of the revolution I left my studies and worked in a tool shop, sharpened knives for meat-choppers, posted bills, worked as a labourer for market gardeners near Moscow and for some reason or other wanted to be a cinema actor.

In 1920 I heard by chance that students were being accepted for a one-year wireless course. I applied for admission, but without the slightest enthusiasm; I was accepted, and unexpectedly discovered a decided gift for this profession. After finishing my training I worked in various wireless stations. One day I heard that a wireless operator was required for some northern island post. What island it was and where it lay I did not know, and to tell the truth, did not care. The "northern island" proved to be Novaya Zemlya. This was how I first came to the Arctic. Having spent a year at the Matochkin Strait Station, I, like many others before me, came to love the Arctic and decided to spend the rest of my life working in the Far North. In 1927 I again undertook to winter at the same station, but this time I took some short-wave receivers with me, and for the first time made friends not only in the U.S.S.R. but in Paris, London and Scandinavia. Later I took part in the expedition which organised the first station on Franz Josef Land and spent the winter at that station. During this winter I succeeded in establishing contact with the Antarctic. This happened on January 12th, 1930. After finishing my usual transmission, I gave the signal "To all" and asked for replies on wave 42 m. I heard through my earphones first the call signal and then a question as to where I was. The question was put in English.

I replied that I was on Franz Josef Land, in a Soviet winter station. This information had an unexpected effect.

"My dear friend," said the other voice, "we seem to have beaten the distance record for wireless communication. You are speaking with the base of Admiral Byrd's American expedition in the Antarctic."

The conversation continued. I told them that it was Polar night with us, that it was cold and that seven men were wintering here. The other replied that they had the Polar day, that it was two degrees above zero, that the weather was gloomy, that their expedition consisted of forty-two persons and that they were soon going to fly to the South Pole. The conversation, at first carried on in English, was afterwards continued in German. We talked for about an hour and a half. Next day we again had a talk lasting about an hour. Although the power of my station was only 250 watts, and that of the American station only 700, audibility was excellent. However, after these two communications I did not again succeed in getting the Byrd expedition. Later Byrd in his description of the expedition mentioned this unusual incident.

In 1931 I participated, together with Professor Samoilovich and Professor Molchanov, in the Arctic flight of the airship *Graf Zeppelin*. We flew from Friedrichshafen to Franz Josef Land by way of Leningrad and Archangel. From there we turned East, flew over Severnaya Zemlya to Cape Cheliuskin, turned back and returned to Leningrad by way of Archangel. The whole expedition took 104 hours in all; we had flown about 8,000 miles in this time.

The following year I took part in the historical voyage of the ice-breaker *Sibiriakov* when it sailed from Archangel to Vladivostock by way of the Northern Sea Route in a single navigation season. Later I went with the *Cheliuskin* on its last voyage and after the disaster to that ship was

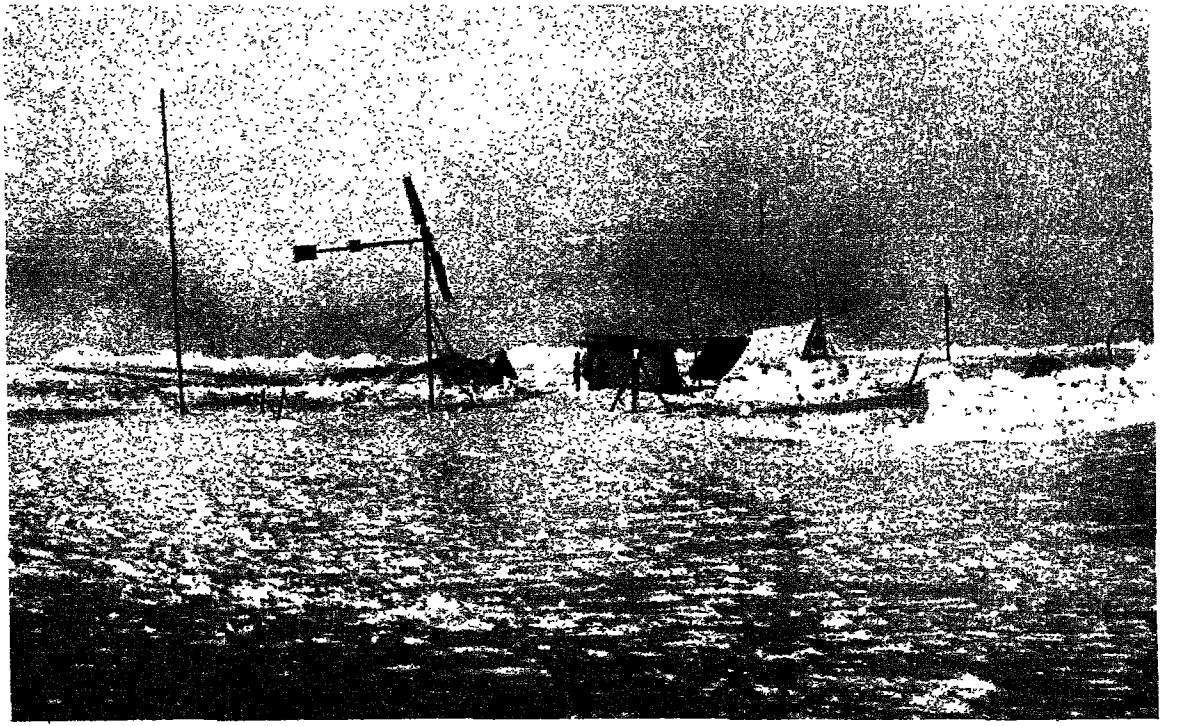
saved, with my companions, by the heroes of the Soviet Union sent to our rescue by the Party and the Government.

In 1935 I was appointed chief of the new Polar station which we ourselves had established at Cape Olovyany (Cape Lead) on Severnaya Zemlya. We got on well together. Our work was not very complicated, the schedule of the station being pretty modest. Through the wireless we heard of the great development of the Stakhanov movement in the country. We sat there, the four of us, in our little Polar station, and tried to find some way of participating in this mass movement. We found it irksome that we four sturdy fellows should do nothing all day except read a thermometer four times a day and transmit the readings to Moscow. Surveying our forces and opportunities, I asked permission from Moscow to split up our group into two sections: one to remain at Cape Olovyany and the other to push further North towards the Polar station established a few years previously on Domashny island. The latter had been closed since 1935. In the spring aeroplanes came and transferred us to the new station. One more scientific research centre was born in the Arctic Ocean. Our work made good progress. Towards the end of the winter my comrade and I fell ill with scurvy as a result of an insufficient and ill-balanced diet. The timely arrival of an ice-breaker, which carried us to the mainland, ended our troubles. I returned to Moscow and began to prepare for wintering at the North Pole.

For my work in the North I have been awarded the Orders of the Red Star and of the Red Banner of Labour.

Peter Shirshov

I am thirty-two years old, and was born in Dniepropetrovsk. My father was a printer. My early days were spent in study. I got my degree in biology after a course



16 AT THE NORTH POLE

General view of the camp of the members of the expedition. *Extreme right:* the tent occupied by Schmidt, Vodopianov, Spirin and Babushkin

of study in the Odessa Institute for People's Education. At the same time, in another faculty, I worked hard at a Social and Economic Science course. Subsequently, I worked in various scientific institutes, making hydrobiology my speciality. I went North for the first time in 1930 when I took part in an expedition to the Kola Peninsula. Later I went to Novaya Zemlya and took part in the voyages of the *Sibiriakov* and *Cheliuskin*. In 1935 I sailed with the ice-breaker *Krassin* to the Sea of Chukotsk.

Our forced wintering on the *Cheliuskin*, and the subsequent life on the ice-floe, which lasted two months, were a great pleasure to me. I succeeded in taking systematic observations of life in the Arctic during the winter. No such observations had been taken until then. Moreover, our long stay on the ice convinced me that it was quite feasible to spend a whole winter on the drifting ice-floes of the central Arctic basin. A few years previously Soviet scientists had suggested the organisation of such a winter station on the ice, and I was an ardent adherent and supporter of this project. I considered that the fear that the movement of the ice would make it impossible to live and work there quietly was greatly exaggerated.

The results of the scientific work done on the *Sibiriakov*, *Cheliuskin* and *Krassin* were summarised by me in a book which is due to come out very soon. This book is a survey of everything that is known about the seasonal changes in the composition of the plankton in relation to external conditions.

On my return from the expedition to the Chukotsk Sea I began to prepare for spending the winter at the North Pole. This idea had been first suggested by Frithjof Nansen. He thought the operation could be carried out by a small group equipped with the necessary food, fuel and tents; the group could be landed from an airship on the ice somewhere in the central part of the Arctic Ocean. During

six months or a year such a group, thought Nansen, could carry on systematic observations of the climatic and hydrological conditions in that ocean. Nansen himself did not succeed in putting his idea into practice. But, following in his footsteps, Harold Sverdrup attempted a similar expedition in 1932 (in co-operation with German scientists) but the venture was a failure. The idea found an ardent champion in Professor Wiese, scientific head of the Arctic Institute of the U.S.S.R., whom only ill-health prevented from participating in our expedition to the North Pole.

Subsequently the idea was gradually nursed to maturity by Otto Schmidt. In the first conversation I had with him about wintering at the North Pole in 1932, during our voyage on the ice-breaker *Sibiriakov*, Schmidt appeared very much in favour of our aspirations but said that the time had not come for such an expedition, considering how little we knew the North and how insufficient was our technical equipment. I asked him to put down my name in the event of such an expedition ever being organised. Schmidt smiled, promising to remember my request. During the voyage of the *Cheliuskin* and the days spent on the ice-floe after the loss of the ship we frequently discussed this favourite plan of ours. However, all this was mere talk.

Returning in 1935 from the voyage of the *Krassin*, I heard that the talks were being turned into reality. I appealed to Otto Schmidt and got his personal consent to my participation in the expedition, but with the reservation that the final choice of members for the wintering group lay with Papanin, who was designated as chief of the drifting station. At that time I hardly knew Papanin, but he had heard of me from Schmidt, Wiese and other Arctic experts and scientists. Without waiting for an official application from me, Papanin decided to include me in the list of participants.

For my part in the voyages of the *Sibiriakov* and *Cheliuskin* the Soviet Government awarded me the Orders of the Red Star and of the Red Banner of Labour.

Eugene Feodorov

I am the youngest of the inhabitants of the North Pole. My age is twenty-seven. My father was an officer in the Tsar's army. He took part in the World War, and was later a commander in the Red Army. My time both in childhood and in adolescence was spent in study. In 1927 I entered the physical and mathematical faculty of the University of Leningrad. My speciality was at first geophysics and later terrestrial magnetism. While I was still a student I worked in the magnetic survey of the U.S.S.R. in various districts, and was chief of the group operating in the Northern Urals. Immediately after graduating I took up work in the Arctic. That was in 1932. I spent the winter on Franz Josef Land in Pacific Bay. Papanin was chief of that station.

I never liked theoretical work limited to the laboratory. The main reason why I chose terrestrial magnetism as my subject was that this work entails lengthy expeditions. The journey to the Arctic was merely a logical consequence of my whole train of thought. At the winter station I had two jobs: to look after the magnetic observatory and to carry out a magnetic survey of the archipelago. I had never been in the North before, knew nothing about Polar travel, and did not even know how to harness a dog. Almost immediately after our arrival in Pacific Bay we decided to visit one of the nearest islands in order to try out our travelling equipment. We were all novices and took three days to travel sixteen miles. On the road we were overtaken by a snowstorm and had to determine our direction with the aid of a compass. When the horizon is smothered

in fog it is difficult to believe that the compass is right. Papanin constantly deviated from the course. We put him right but he thought that the compass was wrong and tried continually on the sly to turn us to the right.

It was on this trial journey that I first met a polar bear. It was a clear moonlight night, and I was observing the stars. Turning round I saw a bear standing at the back of our tent and sniffing at the canvas wall just over Papanin's head. Papanin, who was asleep, felt the touch of the bear's nose, woke up and asked me sleepily why I did not let him sleep. I replied that a bear had called. Papanin immediately jumped out of the tent and fired at the bear, which ran away. We rushed after it, but it was too quick for us.

The return journey took us five days.

In the spring we began a series of journeys all over the archipelago. There is as yet no exact map of Franz Josef Land in existence. The numerous expeditions which had visited that part of the world gave good descriptions of one or other section of the archipelago but only approximate indications of the position of other islands. Therefore we carried out a topographical survey, corrected the existing maps, and added to them all the newly discovered capes, bays and even entire islands. I had often read of the emotion felt by people who see islands which had never been seen by man before. With us it somehow all seemed very prosaic. We frequently found an island not indicated on existing maps, that is to say, "discovered" it. We just sketched them in and went on. Our journey lasted twenty days, making fifteen to twenty miles a day. We often saw polar bears and it became a hobby with us to hunt them, taking photographs at the same time. My companion, Kunashev, would keep the bear, which was surrounded by dogs, covered with his rifle while I took a few snaps.

In this way, working, hunting, and taking photographs,

we reached Rudolf Land, the most northern point of the Franz Josef archipelago, where at that time there was a small Soviet winter station with a staff of four. Here we were overtaken by the Polar spring. The sounds between the islands turned into open water one after the other, and we had to wait four months on Rudolf Land before we were taken off by the steamer *Smolny*.

In the spring of 1934 I accompanied Papanin and wintered with him at Cape Cheliuskin. During the first few months of our stay there we were very busy building dwellings, storehouses, huts for scientific work and a new wireless station. We had a small aviation group with us and the winter began with a tragedy. Flying in the fog, one of our pilots, Vorobiov, crashed against the steep rocky coast. The machine was smashed and he and his passenger, Shipov, killed.

At this station we first thoroughly tested two aerosleds under Polar conditions. They worked perfectly, and Papanin knew what he was about when he included these, his favourite machines, among the means of transport when he set up his base on Rudolf Land. There was a great deal of work to do. In addition to scientific observations, current construction activities and expeditions, we spent a lot of time in self-education. We formed all kinds of study groups, and our subjects varied from the history of the Party to English and German.

When spring came we undertook a number of expeditions into various parts of the Taimir Peninsula. We were often accompanied by the aeroplanes of the winter station, which showed us the best way. One of these journeys, undertaken to investigate the River Taimir, lasted three months. During that time we determined a number of astronomical points, added to the map a number of tributaries unknown up to then, and carried out magnetic observations.

I returned to Leningrad in 1935, and almost immediately began to prepare for the winter at the North Pole.

VII

ICE-FLOE NO. 3

OTTO SCHMIDT JUMPED out of the aeroplane and ran to the staff hut and the telephone. He was impatient to find out whether the wireless of the winter station had established contact with Alexeiev. He returned with a heavy heart: no contact had as yet been made. Golovin came up to meet us with his head swathed in a broad bandage. While we were away he had had a very serious attack of ear trouble, and the doctor had given strict orders to keep him in bed. But to-day, hearing that our squadron had started and seeing the unbroken blanket of cloud over Rudolf Land, he had taken the aeroplane U-2 and flown through the clouds to meet us and show us the way.

"I can go up and find Alexeiev," he said to Schmidt. "My machine is absolutely in order and the crew ready."

"How much petrol can you give Alexeiev?" the chief of the expedition enquired.

"A thousand kilograms," the pilot replied.

"Very good. Make ready. Ritsland will go with you as navigating officer."

A few minutes later we were all on our way down to the winter station on aerosleds. Only the crew of our aeroplane stayed behind at the aerodrome. We gathered in the navigating officers' cabin and celebrated the occasion by drinking a bottle of brandy presented to us by the chief pilot in honour of our return to earth; then we made our way back on skis.

After our life on the ice-floe it was very pleasant to see once more the houses of the Polar station, the wireless masts

and the huge store-houses. We recognised each inhospitable stone on the way, each heap of snow, and even the ski tracks we ourselves had made two weeks earlier. Festive flags were waving from the station flag-staffs. And little flags decorated the entrances to the houses. But the buildings themselves were empty and seemed uninhabited. The whole population of the winter station had congregated in the wireless hut, where a conversation with Alexeiev was in progress. The chief pilot of the N–172 reported that everything was all right. The aeroplane was undamaged, the crew was well, and the ice-floe first-rate. They had left the clouds behind at a height of 1,500 feet. They searched for a long time before they could find a suitable spot for landing. The ice was broken and uneven. When they landed, Jukov, the navigating officer, determined the position, which was latitude 83° 37′ and longtitude 61° 30′. There were only about sixty gallons of petrol left in the tanks.

"Glad to hear you are well and hearty," Schmidt replied cheerfully. "What were you thinking of doing next?"

"Going to sleep," Alexeiev replied.

"Pleasant dreams then!" Schmidt rejoined.

Libin, the chief of the station, invited us all to a meal. There was a festive and appetising display in the mess-room. a wealth of all kinds of wine and vodka were on the table—an invitation to drink and be merry. But having imbibed a couple of small glasses of brandy, we left the table and lay down to sleep. We were all tired out by the sleepless night and those anxious hours of the flight when each of us, concealing his anxiety, more than once stole to the petrol tanks to read the gauges and asked himself uneasily whether the petrol would hold out to Rudolf Land. This suspense had wearied us far more than the journey itself from the North Pole.

The next communication with Alexeiev's aeroplane had been fixed for 7 p.m. Precisely at the appointed minute the

receiver brought us Jukov's dry, clear-cut, slightly bored voice:

"Hallo, Rudolf Land. Hallo, Rudolf Land. Alexeiev aeroplane calling. Good morning all. We have all slept very well and are now having a meal. We are sorry that Shevelev is doing Vilenski's job. He has thrown samples of all our concentrated food into a saucepan and thought they would cook themselves. The result is an awful mess. Could you send us Vilenski along with the petrol? By the way, when is Golovin due to start?"

That evening the weather in our region took a decided turn for the worse. We had a fog again, low-lying cloud and very bad visibility. Flying was out of the question. Golovin and his crew waited at the aerodrome and played preference. The future Hero of the Soviet Union was decidedly out of luck: flying was impossible and he was losing every trick. The pilot's brow grew more and more clouded while his mechanic's grew more and more cheerful.

To provide for all emergencies our own machine was also prepared for flight. The crew of the N–172 transmitted from their floe several private wireless messages to their families. At the end they gave as the address of the senders: Ice-floe No. 3, 172, Alexeiev Street, Northern Arctic Sea. This was the third ice-floe on which the N–172 had landed; numbers 1 and 2 were at the North Pole and the Papanin camp. All the members of the expedition liked the address, but Professor Otto Schmidt, as president of the geographical section of the Academy of Science of the U.S.S.R., was indignant at its geographical inaccuracy:

"Kindly take note once and for all that by decree of the Soviet Government the Northern Arctic Sea was officially renamed Northern Arctic Ocean. 'Sea' is a term applied to circumscribed basins," he informed the senders of the wireless message.

The crew of the N–172 seemed to be feeling very much at home on their ice-floe. They were in excellent humour and full of energy. Shevelev apologised and said that the reason why he could not come to the microphone precisely at the appointed time was that the soup had boiled over. Jukov taunted the Rudolf islanders with being late, and suggested that they should verify their time-pieces. This was done.

"There you are," the navigating officer of Alexeiev's aeroplane explaimed pedantically, "your watch is thirty seconds slow."

The day after our arrival we had a tremendous treat: a bath. True, for this purpose, we had to work six hours heating the bath-house and melting snow for water, but it was worth it; everything was done as in the big towns. At the entrance to the bath there was a table, and on the table a huge jug with moss-berry squash. This disappeared just as quickly as our laboriously heated water. Each man was given a clean sheet as a bath-towel. We bathed for between two and three hours, steamed ourselves almost to unconsciousness and gave up our places to the next comers with the greatest reluctance. Molokov and Vodopianov climbed up on to the top shelf and were in the seventh heaven of bliss. Spirin, who had never tried a real Russian bath, was at first greatly delighted. "Here! Put on another saucepanful," he shouted at Mazuruk. But soon we had to carry him out on a stretcher—he was overcome by the hot steam. Golovin and Akkuratov, steamed pink, rushed out of doors, rolled in the snow, and then returned into the steam. All day long the bath-house was the centre of all social activity.

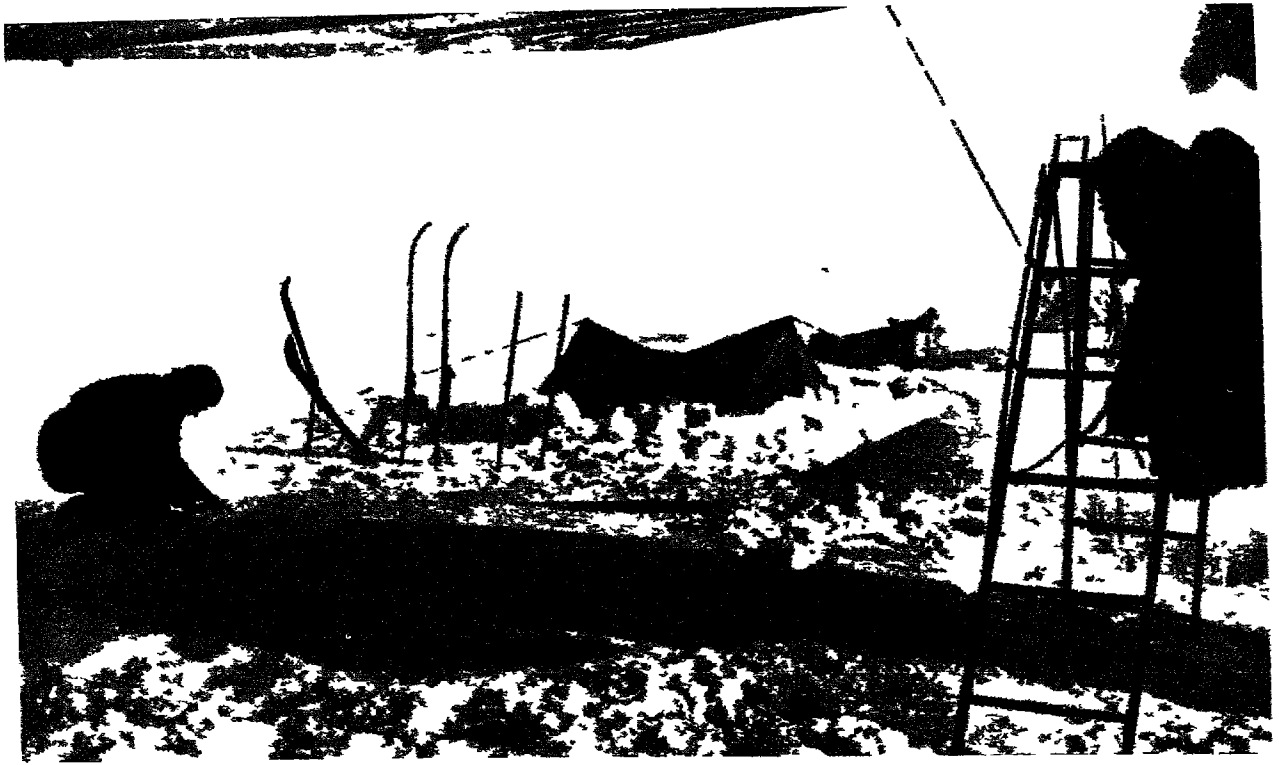
At intervals of two or three hours our wireless operators made contact with Jukov and Shevelev—partly for business and partly for pleasure. Alexeiev's floe was rapidly drifting North. It is a curious fact that in that region the direction

of the drift was exactly opposite to the set of the drift in the central part of the Arctic. In twenty-four hours "Ice-floe No. 3" had moved nine miles northward.

Life on the floe passed quietly and unhurriedly. Sugrobov, Ginkin and Schmandin examined all parts of the aeroplane and convinced themselves that it was in excellent condition. Moshkovski investigated the ice-floe and found that it was three feet thick, with a comparatively smooth and even surface.

Kruze and his aeroplane were out there somewhere beyond the 85th parallel; we had no news whatever of them for two days. Something had obviously gone wrong with his transmitter. On the 8th of June contact was at last established. The engine of the transmitter had broken down and Chernishev, the mechanic, had spent two days in repairing it. The loss of contact did not worry the light aeroplane's crew in the least. They did their work, each his own job, and while Chernishev was repairing the engine, Navigating Officer Rubinstein eagerly listened in to the ether and kept the comrades well posted as to the latest news. They all knew how and where Alexeiev had landed, what Papanin was doing at the North Pole, and what wireless messages I had sent to *Pravda*. Rubinstein used the direction indications sent out to Alexeiev to determine his own position. One day these involuntary residents on the ice saw a bear. A shot went wide and the bear got away. "It went all white, all white, just from fear," Rubinstein told us later. This was the first bear ever seen at such high latitudes. In three days our comrades had drifted on their ice-floe forty-six miles to the North and on June 8th their position was 85° 39′ North.

On that day the weather began to improve both at Rudolf Land and in the North. The sun showed through breaks in the clouds. Golovin began to warm up the engines



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AT THE NORTH POLE

One of the tents of the crew of the USSR–N–171

of his aeroplane. Both Alexeiev and Kruze were on practically the same meridian. This was very convenient because when the wireless beacon gave Alexeiev the direction, Kruze could also use the data. At 5 p.m. Schmidt, after a talk with Jukov, asked him to inform Kruze that Golovin was preparing to take off.

"All right, I'll tell him," Jukov replied, and we immediately heard his calm voice in the receiver:

"Hallo! Hallo! Alexeiev aeroplane, calling. Calling Kruze aeroplane. Tune in: one, two, three, four. . . . "

"Is this really happening in the Arctic?" Dogmarov exclaimed in wonder.

Yes, it was in the Arctic, but in an Arctic conquered by our scientists. Only two decades ago one of the most poignant Polar tragedies was enacted at this very spot. The merciless ice caught the ship *Saint Anna,* and drove it inexorably towards the North. On the very spot where Alexeiev's aeroplane was lying now, Captain Albanov with ten of his messmates abandoned the doomed ship and tried to reach dry land on foot. Less than a hundred and twenty miles separated them from Rudolf Land. Yet it was only after two months of terrible sufferings that Albanov won through to the islands of the archipelago and it took him another month to reach Cape Flora. Out of eleven men only two survived; the others perished on the way. And now here were we cheerfully talking and joking with our comrades by wireless telephone, and hearing their voices more clearly and more loudly than through an ordinary city telephone.

At 6 p.m. Kruze asked for his bearings, announcing that he was warming his engines and would take off in half an hour.

That was the start of a great day of aerial activity. The whole operation developed with splendid vigour and

precision. The hill on the island was smothered in fog, and we saw Golovin's aeroplane dive out of the mist, circle over the station and then streak away on a northern course. Fifteen minutes later our loudspeaker began:

"Alexciev aeroplane speaking. Five minutes ago Kruze's aeroplane passed over. Prepare to receive him. How are things?"

"Golovin is on his way to you. Try to get in touch with him."

Two minutes later we heard Jukov calling Golovin:

"Hallo, Golovin aeroplane! Alexeiev aeroplane calling. Weather fair here. Cloud 1,500 feet up. Can you hear us? Please reply."

The Rudolf Land wireless beacon was constantly sending out signals into the ether to guide the aeroplane on its way. We were sitting in the hut waiting for Golovin to land on the ice and Kruze to arrive. Suddenly we heard the roar of engines over the island. We all rushed out of the hut. Kruze circled round and landed. We had hardly time to shake hands with the crew when the wireless operator reported:

"Alexeiev has sighted Golovin."

Then Jukov announced by wireless telephone:

"Golovin is circling over us . . . he is coming lower . . . he has landed . . . I am off to meet him. . . ."

We were all elated by our comrades' skill, the good weather and the sunshine. For the next hour no news came from the ice-floe. Then Shevelev's voice thundered, filling the whole hut:

"Hallo, Rudolf Land! All hands are busy refuelling. This petrol is somehow specially nice—it smells wonderfully pleasant. We shall be ready in an hour. The crews of both machines are working hard. We are pouring the fuel from Golovin's tanks into cans, carrying them to our machine and emptying them into our tanks."

At 11 p.m. the refuelling of Alexeiev's aeroplane was complete. Its empty fuel tanks were filled with 250 gallons of petrol. Thirty minutes later Shevelev asked for bearings for Golovin, who did not wish to lose any time; he had done his job and was returning to the mainland. The wireless beacon went on duty again, and once more we ran out into the open to scan the bright horizon. Soon a dot appeared in the sky, a dot which soon turned into a dash. A little later it was an aeroplane, coming nearer and nearer. Already we could hear the roar of the engines; then Golovin glided down and landed. The wireless beacon carried on, for Alexeiev was now also on his way and soon the loud-speaker said:

"Hallo, hallo, Alexeiev aeroplane speaking. We are approaching the island. The coast is in sight. Prepare dinner, your embraces and a bath. Receive wireless message for *Pravda:*

"'Last aeroplane of North Pole air expedition is leaving central region of Northern Arctic Ocean. We are in sight of the coast of the Archipelago and shall soon reach Rudolf Land. We are returning to devote all the knowledge and experience acquired and all the strength and energy we possess to the service of our beloved country. We are convinced that our Party, our Government and that wisest of men, our beloved leader, Comrade Stalin, will send dozens and hundreds of ships along this route. We shall be very happy if they again show their confidence in us and entrust us with some new arduous task. Shevelev, Alexeiev, Jukov, Moshkovski, Sugrobov, Ginkin, Schmandin.'"

The last aeroplane of the expedition to return from its distant flight flew in a majestic circle over the island. Schmidt, Vodopianov, Molokov and Spirin rushed to the aerodrome to meet our daring friends.

VIII

SOUTHWARDS

DURING THE NEXT few days we searched the whole coast of the mainland from Cape Cheliuskin to Murmansk for snow. Our aeroplanes were equipped with runners and could only land on a snow aerodrome. But the snow had already melted practically everywhere on the mainland. Our last hope was Amderma. There a thin blanket of snow still remained in the valleys. But even from there alarming reports were coming in. The director of the mines informed Schmidt that the snow was melting and that bare patches were showing on the field selected for an aerodrome. The miners were bringing snow from other spots to the aerodrome in lorries, to cover up the bare patches. In a few hours they would have to bring more snow.

We had to move, and that without a moment's loss of time, or else risk being cut off from the mainland until an ice-breaker could arrive and bring us wheels. And that would be in two weeks or in two months. It all depended on ice conditions.

The mechanics had long ago prepared all the machines for the start. Four 'planes started out: the heavy machines piloted by Molokov, Alexeiev and Vodopianov, and Golovin's machine. Mazuruk's planes, the P–5 and the U–2 were to remain on the island ready to fly to Papanin's aid should the need arise. The pilots Mazuruk and Kozlov, Navigating Officer, Akkuratov and the mechanics Shekurov, Chernishev and Bezfamilni were to remain behind with the machines until the autumn.

Dzerdzeievski informed us that the weather on our route was none too good. We would have to fly above clouds, below clouds and through fog. However, we could not wait any longer, and on June 15th Schmidt gave the order to get ready to start. The mechanics drove out to the aerodrome during the night and at eight o'clock in the morning the engines of all the machines were already running. Vodopianov and the other chief pilots made the rounds of the whole aerodrome and returned frowning and taciturn. Spring had come even here, and the snow was spongy and sticky. It would be extremely difficult to take off.

Tractors were driven up to the flagship, and dragged it along with great difficulty. The aeroplane moved hesitatingly over the slope of the hill, sank into the spongy snow and turned back. The chief pilots were extremely irritable. Vodopianov again taxied to the start, and again launched his machine down the slope. The machine ran along for what seemed a dreadfully long time but at last tore itself away from the snow.

It was now Molokov's turn to taxi to the start. We glided along the tracks left by Vodopianov and approached nearer and nearer to the sea, but our speed was quite insufficient. If the machine met with the smallest bump the hand of the speedometer would immediately jerk back. When the edge of the ravine was only 400 feet away Molokov turned the machine. Overheated by the terrible strain the engines began to boil. We had to stop, open up the covers and let the engines cool. Golovin was equally unsuccessful in his attempt to take off. Alexeiev had to refrain from even attempting a start, as we were blocking up the runway.

The island was covered with a low blanket of cloud which hung over us like an impenetrable canopy. Somewhere out there above the clouds our flagship was circling. We could

clearly distinguish the roar of its engines. Molokov informed Schmidt by wireless of our failure to take off and suggested that the flagship should go on its way alone. Schmidt however, took a different view. The aeroplane N–170 pierced the clouds and landed on the field in spite of the danger of landing with an overloaded machine. It made a perfect landing.

All the aeroplanes were again drawn up at the starting line. The weather was getting worse and worse. The top of the hill was hidden by fog. Time was passing, and it was nearly evening. Mazuruk, sent out to reconnoitre with the U–2, circled round for about an hour and returned with the report that the cloud-blanket was thin and that the weather was improving to the South. At a lightning conference of the chief pilots, Schmidt recommended an immediate start. This time it was Molokov who was to take off first. We warmed up the engines. Molokov looked gloomily at the white shroud spread out before his eyes, and took his seat without a word. At that moment Vodopianov ran out to the aeroplane.

"Vasia," he said in a slightly apologetic and husky voice. "Do you know, I think we should wait. It's all right for me to fly in weather like this. But when I look at the others I feel scared. Let us wait, Vasia. What about it?"

Molokov smiled.

"All right, let us wait, Misha," he said simply and with understanding. "I think you're right and that it's better to wait."

We were dreadfully tired and went to sleep. Ritsland lay down across the navigation cabin; Molokov and Orlov slept sitting in the pilots' seats and Ivashina curled up under the petrol-tank. After two hours the weather cleared up slightly. The order was given: "All aboard." Schmidt, surrounded by the staff of the Rudolf Land station, made a

farewell speech thanking the inhabitants of the island for the splendid work done in helping the expedition.

There had been many difficult starts during the whole Polar epic, but this one beat all records. The aeroplanes again glided down the slope—a slope which soon turned into a precipice. But we had to take off, come what might, and Molokov resolutely steered his machine straight towards the precipice. We felt a slight shock and the machine was in the air. "Would it remain there or would it crash?" each of us asked himself. If the speed was high enough we would fly. If it was not we would crash into the ocean. The speed proved sufficient, and the machine rose steadily above the sea.

The other aeroplanes took off and followed us. The squadron broke through the clouds and emerged into the sunshine. We could see the sea and the pack-ice shining through a milky veil. Above us lay another greater bank of clouds with many breaks in it. The flagship proceeded on its course and the others followed in its wake. The hand of the magnetic compass pointed to 180: our course lay due South.

The clouds hid the archipelago from our eyes. Only here and there could we catch a glimpse of the island peaks through a break in the clouds. Their snow-covered tops looked like sugar-loaves. Our aeroplanes were climbing, and the altimeter showed 4,500 feet. On our left we saw the wild, serrated crags of Grill Island. The line of mountain ridges which form this island looked like the battlements of an ancient fortress. Their sides were lost in a carpet of clouds and covered with a lace veil of mist. Black shadows emphasised the depth of the ravines.

The clouds stretched to the right of us, sometimes smooth, even, and thick and white as cream, sometimes porous and frothy. The mist curled up over Berghaus Island like smoke from a volcano. The giant cone was truncated as if its top

had been shorn off by a sharp knife. The slopes of this majestic island, bare and laminated, make a marvellously beautiful spectacle.

We passed another stretch of clouds and saw the Barents Sea below us. We saw the lace-work of small-grained pack-ice, broken only now and then by the flat pancakes of ice-floes. Ritsland tuned in to the wireless beacon of Cape Jelaniya, and asked the mainland for a weather report. We had Golovin on our left, Alexeiev on our right, and the flagship in front of us. After four hours in the air we saw a white streak ahead.

"That is the coast," Ritsland cried joyfully.

It was in fact the coast of Novaya Zemlya.

Through the ragged sieve of clouds the clear water showed dark. There was no ice: it would be extremely unpleasant to have to land here. The coast came nearer, very, very slowly. The mountains of Novaya Zemlya emerged from the froth of cloud as we crossed the line of the coast. The mist and the clouds broke on it like waves. Our aeroplanes were passing over Novaya Zemlya. Below us lay a fantastic pageant of primeval nature. Snowy peaks, wind-swept slopes, and a wild, unimaginable tangle of ridges. The earth bobbed up here in enormous wrinkled folds like hurriedly kneaded loaves with gigantic cracks in their crusts.

The squadron came out over the Kara Sea and passed South, along the eastern coast of the island. The rugged coast was intersected with fantastic bays, peninsulas and lakes. Scattered in the sea, we could see tiny, rocky islands that looked as if they had been flung from the gloomy shore by a giant's hand. The sea was quiet and smooth, but inhospitable.

In front of us lay a low wall of cloud. The aeroplanes approached it at an obtuse angle and dived towards the water. Thin little clouds like a light mist rushed past, and

then we cut through another layer, which looked like the smoke from a good pipe of tobacco. And now the sun had gone: we were below the clouds. The aeroplanes now and again rolled and plunged. Ahead of us lay the smooth expanse of a wide sound—the Kara Strait—through which the whole of some European countries could pass easily. The strait was open and free of ice. Near the Ozernaia Bay we saw the black shape of the ice-breaker *Sibiriakov,* wrecked the previous year on the submerged reefs of the bay. We passed along the grim and inhospitable coast of Vaigach Island and found ourselves faced with another wall of cloud reaching almost to the water. We dived lower until the height gauge showed a mere 150 feet. At times the aeroplane seemed almost to touch the ground. The machine was completely enveloped in fog and we could not see any of the other machines. We expected a collision at any moment. Molokov flew over the Vaigach coast, with the idea, as he explained later, that "if we're to crash, then let it be on land". Our pilot was flying blind and ordered Ritsland and myself out of the navigating cabin because in the event of a crash it would be flattened to a pancake.

The flagship sent us the order to land at Amderma. I wanted to take this wireless message to Molokov, but he, usually so good-humoured and pleasant, barked at me so ferociously that I understood it was a crime to interfere with him at that moment.

The fog lifted at last when we were already flying over Amderma. Below glistened the narrow, snowy strip of the aerodrome. "Do they want us to land on that bit?" Orlov asked in an appalled tone of voice. He was right. It needed an almost superhuman courage to try to land our heavy aeroplane on that pitiful little patch of snow.

However, the only other choice was to return whence we came. So Vodopianov resolutely steered the 'plane towards

the ground. He taxied along the whole length of the scanty runway and stopped at its extreme end. Golovin was the next to land. We followed. There was no room left for Alexeiev behind us. He carefully calculated his every move, cautiously brought his machine down to the field, and by a feat of mathematical precision taxied past us with not more than eighteen inches to spare. Had he left more room between us he would have slipped off the strip of snow on to the stony ground and crashed; had he left less he would have collided with our machines.

Men were running from all sides towards our machines, waving their arms and cheering. Motor-cars, lorries, and tractors rushed up, and horses galloped towards us.

We were on the mainland again.

IX

ON THE MAINLAND AGAIN

WE ALL POURED out of the aeroplanes with undisguised emotion. Molokov kicked the layer of snow—it was not more than an inch thick. Under it was the stony ground. The members of the expedition exchanged glances and laughed.

Practically the entire population of this city in the Arctic Circle had come to meet us. The road was crowded with lorries, tractors and galloping, mounted militiamen.

"What a lot of people!" Schmidt said with surprise. "It's funny to see horses again."

A short meeting was held, and then the members of the expedition were driven to the town, which hospitably put all its resources at our disposal. This distant settlement on the shores of the Kara Sea had come into existence only a few years previously. A prospecting party had discovered rich supplies of fluorite here, a substance much in request in the optical and metallurgical industries. At first the settlement was a mere cluster of huts, but later these grew into a little town with several dozen houses and about a thousand inhabitants, boasting a club, a talkie cinema, a quite presentable dramatic society, a hospital, public dining-rooms, baths, a big store, a powerful wireless station, a nursery school, a crèche and a school.

The people here live an active and harmonious life. For eight or nine months of each year they are completely cut off from the rest of the world. Thousands of miles of impenetrable swampy tundra and northern taiga lie between them and the nearest inhabited region.

Mining the precious ore—the famous "violet gold"—these Soviet people burrow deep into the frozen depths of the Arctic earth. Endless tunnels and passages descend by degrees to levels well below that of the sea. The fluorite lies in pockets. It is hewn out, leaving behind on the stony face enormous caves of fantastic shape and outline. The mines are equipped with electric lights, and their glare throws the passages and caves into bold effective relief. But the miners have grown so used to their new home that they pay no attention to the extraordinary beauties of this underground kingdom. What interests them much more is the fulfilment of the daily and monthly output plans or the purity of the ore.

The sea-front of the town is washed by the grim, unfriendly waves of the Kara Sea. For long months the restless expanse of these coastal waters is imprisoned within walls of ice. Ships can only reach the coast where the mines are in July, when the Novaya Zemlya Straits are open. They remain in the offing half a mile from the quay, while lighters fill their holds with the "violet gold". The motor ships carry their priceless cargo to Archangel, Murmansk and foreign ports.

The members of the expedition were far too impatient to wait for July. We were in a hurry to get to Moscow and home. So Schmidt wirelessed instructions to the ice-breaker *Sadko*, which was bringing us under-carriage wheels, to try to get through to Amderma. With the aid of our wireless-station we followed every stage of this exceptionally early voyage. The ice-breaker proceeded easily through the Barents Sea, but only the fine skill and varied experience of Captain Burke enabled his ship to negotiate the heavy ice and fog near Cape Yugorski. Slowly and cautiously the ice-breaker crept forward through the dense porridge of ice. And so on the third day of our stay at Amderma, we saw with excitement the long-expected little wisp of smoke on



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AT THE NORTH POLE

Otto Schmidt, head of the expedition, and Ernst Krenkel, wireless operator of the Drifting Station

the horizon. The sea was covered with heavy ice, and the wisp of smoke approached slowly, very slowly.

At last the ship, so well-known to every worker in the Arctic, anchored in the offing. Through our binoculars we could see them launch a boat which, steering a zig-zag course through the ice, came towards the shore. We all gathered in a group on the quay and tried to guess who would be in the boat. After a short discussion we decided that the men coming on shore would be the pilot, Boris Chukhnovski, Captain Burke and the other officers of the *Sadko*.

The boat reached the quay-side and made fast. A few young men with cameras jumped out, hastily scrutinised our group, picked out well-known faces, and began issuing orders in a tone of authority:

"Smile, please! Don't move! We are taking you."

They were the newspaper camera-men sent to Amderma by the Moscow papers. From that instant the members of the expedition knew not a moment's peace or sleep. The *Sadko* had brought twelve newspaper-correspondents, camera-men and cinema operators. They "shot" us at work, at lunch, at breakfast and at dinner, while we were going to bed, and in our sleep at night. The chief pilots of the aeroplanes had the hottest time. The representative of each paper pestered them with demands for stories, sketches and articles about the expedition.

Vodopianov proved to be the one best prepared to meet the newsmen's onslaught. The author of *A Pilot's Dream* dictated articles, memoirs and observations without ever tiring. A magnificent pilot, he also proved himself an excellent author. All his articles were different, interesting and full of fresh and vivid ideas. Alexeiev, whose inclinations lay more in the direction of punctilious scientific research, though he enlisted the aid of his navigating officer, Jukov, and locked himself up in his room for three days, at the end

produced only one single article. However, this one article was a comprehensive treatise on the ice of the Central Arctic. Molokov, who liked newspapers but was afraid of newspaper men, was so scared when he saw the pack of my colleagues in full cry that he ran away into the depths of the tundra, and did not return until the small hours when the journalists, tired out by their superhuman efforts, were already asleep. However, despite all his efforts to escape the newspaper-correspondents, Molokov was next day cornered by them in the cabin of the aeroplane, and the chief pilot of the N–171, seeing that his situation was hopeless, unconditionally surrendered to the victors and dictated eight articles for them.

Meanwhile our strange snow aerodrome, which the director of the mines had so magnanimously prepared for us, melted away completely. All round, as far as the eye could reach, stretched the grey rocky shores, strewn with stones and pebbles.

The melting snow had formed lakes in the tundra, and the miserable Arctic grass showed in faint green patches. Our mechanics were working night and day on their machines, substituting wheels for the runners. When that job was done they refuelled all the machines, once more inspected all engines, declared that everything was in model order, returned to the town and tackled the provender brought us by the ice-breaker.

The *Sadko* had brought fresh fruit and vegetables, fresh newspapers and letters from our families. We got the latest news from home, learned about international developments and eagerly examined the position in the Spanish war. Of course we also showed due appreciation of the more material gifts bountifully sent by Moscow. The stocks of tomatoes, oranges and apples disappeared at a catastrophic rate. Two days after the ice-breaker's arrival, Sasha Pogosov, formerly

manager of the Cheliuskin aerodrome in Schmidt's ice-floe camp and now representative of the Polar Aviation Board with the ice-breaker, sought out Shevelev and reported in a matter-of-fact tone:

"The oranges are all eaten. You can fly on now."

We could not, however, fly on. The members of the expedition had not left the wireless station for two days. Valerius Chkalov and his friends Baidukov and Beliakov were flying from Moscow to North America, blazing a great air road between the two continents. We listened eagerly and tensely to every phase of this daring exploit. The solitary aeroplane boldly battled with cyclones, cloud-barriers and fogs that obstructed its way. Now it was approaching our familiar Rudolf Land; now it had passed it and was advancing further and further towards the North. Each of us saw in imagination a vivid picture of every phase of this flight: the pack-ice spread below the ANT–25, the cracks, the leads, the ice-blocks. Now the machine was passing the spot where Alexeiev had landed; now it was over Kruze's camp. Now it was approaching the parallel where the Papanin group was drifting; now it was leaving the North Pole behind.

That night the chief pilots of each ship reported to Schmidt that they were ready to start, that the weather on the route was good and that they were waiting for his instructions. Schmidt considered the position.

"No, we cannot start now," he finally told the pilots. "We have no right to leave here until Chkalov has reached land again. Something might happen to his machine. Our 'planes are fully prepared and could immediately take off from here and go to his assistance. We must wait another twenty-four hours."

The aeroplane ANT–25 was victoriously proceeding on its way. It passed the inaccessible Pole, the coastal regions

of North America, and reported that it had left Patrick Island behind.

"Get the squadron ready," Schmidt said to Vodopianov. "We can start now."

But there was nothing to get ready. The mechanics immediately started the engines, and were standing near the hatches with a careless air—but their faces were eager, joyful, and freshly-shaven. It was a lovely sunny day. The sky stretched over our heads like an endless blue thread and a warm caressing wind fanned our faces. Regretfully, we stored our warm fur clothes in the wings of the aeroplanes. We had become so used to them in three months that we looked on them as an almost necessary attribute of the human frame, something very much like our own skin. The mechanics playfully struck the wheels with their hammers, as if to make sure that they were not frozen to the warm earth.

A rapid and easy run, and the flagship rose into the air. After it came Golovin, then we, and finally Alexeiev. The whole start took us no more than five minutes. From the air the town seemed like a tiny toy village. Far out at sea we saw scattered ice-floes. The tundra was full of water—lakes, brooks, runlets and puddles.

The squadron flew westward in Indian file. Then Alexeiev suddenly pressed forward but was immediately put in his place. In our earphones we heard Shevelev's precise voice:

"Hallo, hallo, flagship calling. Calling Molokov machine. Where are you? In front of us or behind us?"

"Hallo, hallo, flagship. Molokov machine calling. We are behind you. The machine in front to the right is Alexeiev's."

"Hallo, hallo, flagship calling. Calling Alexeiev machine. Why are you flying in contravention of instructions? Why have you passed us? Please return to your place immediately."

"Hallo, flagship. Alexeiev machine calling. Your orders to return to our position received. Will comply."

The aeroplanes were flying over the coast of the Kara Sea. Southern and Eastern winds had driven away the snow, and the dark blue water seemed bottomless. The tundra was mottled with queer little streaks of snow, which looked as if they had been dropped by a careless paint-brush. The squadron passed over Yugorski Strait, which was covered with finely-crushed ice. We were flying at a height of 300 feet against a strong head wind and the 'plane was rocking slightly. Now we were already over the Barents Sea, which was covered with a light fog. A breeze was blowing over the sea, and from above it looked like a piece of wet leather criss-crossed by the white, frothy combs of rollers. An hour and a half after the start our air-fleet entered a corridor of clouds. We were now flying at an altitude of more than 6,300 feet and yet the clouds were still above us. They were different from the layers of cloud we had met in the Central Arctic. Here they were almost inflated, distended, and they floated in the airy ocean like immense white balls. We wore our earphones and heard Schmidt calling the other machines. We had all lost sight of one another in the clouds. In front of us everything was smothered in fog. On our left we suddenly saw Golovin's 'plane for a moment and immediately lost it again in the smokescreen of cloud.

Then suddenly the clouds and the fog ended, as if sliced away by a knife. We were again flying in bright sunshine and below we saw once more clear water glistening in the sunlight. Our aeroplanes were again flying together. Below us lay a few unnamed islands, and in the sea we could see muddy streaks of tundra water brought down by nameless rivulets.

The mechanics were constantly casting anxious glances at the thermometers. Before our flight northwards the

engines and the whole system of oil, petrol and water tubing were specially protected from the cold. We were now returning to warmer latitudes, and the mechanics had every cause to fear that the engines might get overheated. The flagship enquired hourly about the temperature of the oil and the water on each ship. But nothing abnormal developed.

The sun again hid behind clouds. Dark rain-clouds lay in front of us. Was it really going to rain? After a few minutes the panes of the cabin window were covered with raindrops. Molokov came into the cabin. He was very pleased.

"We are in a real shower at last," he said, all smiling. "We are flying to the Spring."

The tundra was covered with countless bright discs: pools of every size, each framed in a fringe of snow. Fantastically meandering rivulets carried the melted snow-water into the sea. The estuary of the mighty Pechora, with its innumerable islands, arms, channels and tributaries, was outlined in the distance. We found that we were hungry and ate Vienna steaks, washing them down with Essentuki mineral water. Somewhere to our left lay Narian-Mar. It was from there that, only three months ago, we flew away to the North, not knowing what was in store for us but confident of success. Now we were returning victorious, and wondered what sort of reception we would get.

Ritsland switched on the wireless receiver and handed me the earphones in amazement. Instead of the traditional signals "A" and "N" the Archangel beacon was sending gramophone records. The plaintive melody of a tango and the merry staccato of a fox-trot floated over the tundra. The pointer of the wireless compass impartially pointed to zero, indicating the straight road towards the northern capital. Little it cared whether it brought in a fox-trot, a

tango, a monotonous tuning-in count, a speech, or choral music, provided the ether vibrated.

Inside the 'plane it was quiet and peaceful. Only the heating-lamps, our fur equipment, the tins of emergency reserve provisions and the rifles leaning in the corner reminded us of the fact that this machine had not been on the warm, hospitable mainland all the time. Below us once again stretched the dark-grey, lifeless tundra. There was not a village, not a single hut to be seen. We passed Cheshskaya Bay. Its surface was clear, calm and dark blue, reminding us of the friendly waters of the far-away Caspian Sea.

Suddenly we saw below us, among the bends of the River Snopa, green patches—little woods. It was nice to see green again. I remembered how the modest bedraggled shrubs and pitiful flowerbeds of Krasnovodsk had affected me after a weary journey of many days across the sands of the Kara-Kum Desert. Nor was I less pleased to see again the green shallows of the Archangel coast when we returned two years ago from our expedition to high latitudes on the ice-breaker *Sadko*. On that occasion the northern seamen cheered the green to the echo. Now it would have been futile to cheer: the roar of the motors would have drowned our cries; but our pleasure was just as great. A tiny settlement was nestling in the estuary of the River Snopa. The thin thread of the road was barely visible. These tiny houses and the tiny road looked very pretty from above. Half an hour later we saw another village, a large one, with no less than fifteen houses. The grass covered the ground like a green sheet. Woods became more and more frequent, and from time to time we saw whole forests.

"We are back among men—and among forest fires as well," Kruze remarked mournfully. In front of us light-grey smoke rose from the forest.

The sun shone brightly. We passed Mezen and crossed

the broad river of the same name. Settlements were becoming more cheerful-looking and more populous. The cultivated fields were clearly outlined. The forests covered the earth like a continuous carpet veined by dry river beds and sparkling snakes of spring rivulets. The flat tundra had come to an end and we were flying over hilly country.

The aeroplane rolled and pitched so that it was difficult to stand on one's feet. The flagship transmitted to us a wireless message just received from Archangel. It said that the weather at the aerodrome was splendidly clear with visibility reaching to the horizon, and that everything was ready for our landing.

I confirmed reception of this message and asked Shevelev to do me the customary favour of transmitting the message to *Pravda*.

"I've already done so," Shevelev replied.

By this time Archangel was in sight. Smoke streamed from the chimneys of the factories and of the ships in the harbour. We were all in a pleasant state of expectation. Ritsland was singing something very much out of tune. Then he switched on the receiver and listened in to the latest news of Chkalov's flight: the aeroplane ANT-25 was flying over the Rocky Mountains. After this the Moscow wireless station "Comintern" broadcast the news that the aeroplanes of the Schmidt expedition were within sight of Archangel. Ritsland listened and nodded his approval. Our squadron flew over the city in open formation. This was our "Northern capital", the home of Arctic explorers. It was from here that the ice-breakers and other ships sailed to all parts of the Arctic. It was from here that the legendary *Sibiriakov*—now lying on the rocks of Ozernaia Bay—sailed on its last voyage. It was from here that the *Cheliuskin*, now lying at the bottom of the Chukotsk Sea, set out on its long voyage. But we had revenged the loss of that splendid ship.

Archangel stretched wide along the banks of the beautiful Dvina river. Steamers and barges ploughed its calm expanse; tugs and lighters ran about like ants. On the right we saw both the sparkle and the mist of the White Sea. We saw the countless green islands of the river. Ritsland was looking at the map, searching for the aerodrome. When he raised his eyes our flagship was already circling over the island flying-field. As the machines lost altitude, we could distinguish the tiny toy aeroplanes standing on the field, a crowd of people, and the bunting of their banners.

Our machines swung in a wide circle and landed. Our journey was over. We were almost on the outskirts of Moscow. Just one more hop and we would again see the capital of the U.S.S.R., the Red Square and the majestic battlements of the Kremlin.

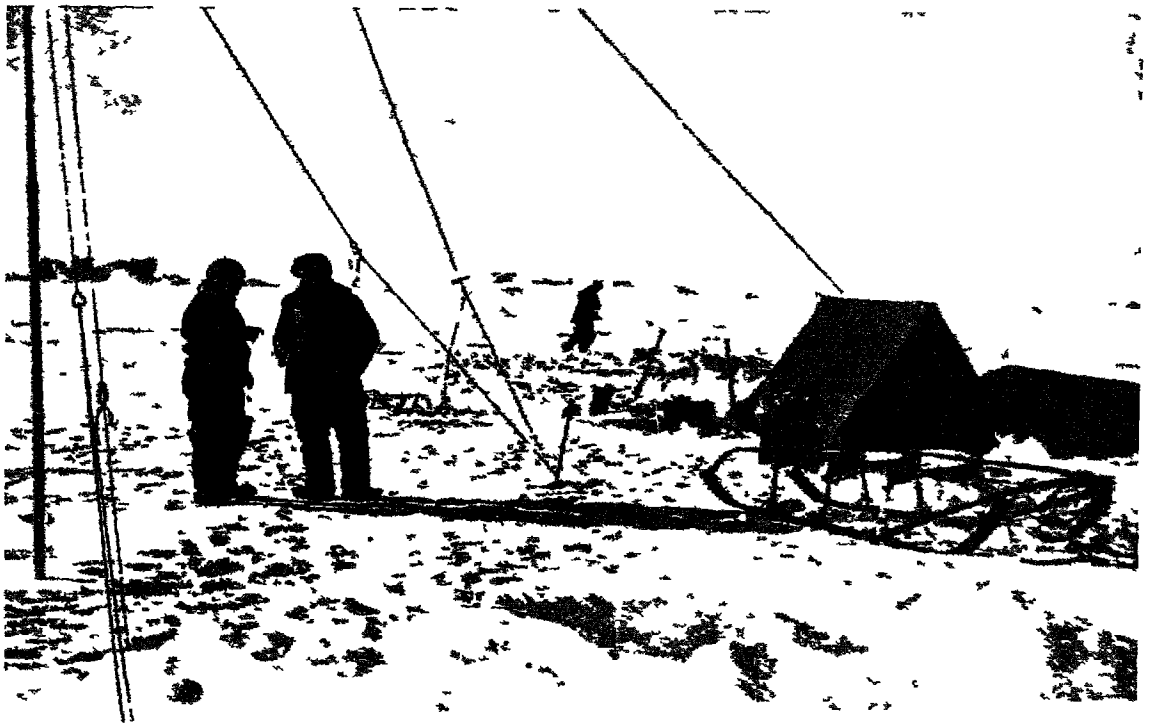
Archangel received us with generous hospitality. The factories and schools, the pioneer groups, the docks and the timber yards vied with each other in giving us invitations and asking for speeches, stories, and talks. Overwhelmed by our excessive popularity we moved outside the town and took up our quarters in the rest-home of the local Executive Committee—the same one which we had inhabited before we left Archangel. The eyes of Vodopianov and Golovin lit up when they fell on the familiar green cloth of a billiard table, and the quiet of the suburban sanatorium was immediately broken by boisterous cries as they started a game.

The mechanics remained at the aerodrome; in spite of Schmidt's repeated and urgent invitations to them to share the common roof, food and lodging, they flatly refused. The last stage of the flight still lay before us, and the technical managers of our machines were fussing with their engines from morning to night, putting the flying monsters into exemplary condition for the flight to Moscow. The green sward of the aerodrome was dotted with the familiar

rubber tents which only a short time ago had appeared like an exotic outcrop on the ice of the North Pole. The sleeping-bags lay in the tents as before, but this time they merely protected the sleepers from the damp air of the night. Curious citizens constantly crowded round the tents. And cases full of empty lemonade bottles, annihilated in incredible quantities by the members of the expedition, piled up in mountains behind them. Two days went by, and our faithful aeroplanes, battered by the ice and the hail and driving snow of the Arctic, began to have a strange look which was very pleasing to the eye. Skilled hands had smoothed the wrinkles on the foreheads of the machines and cleaned and polished them carefully.

What caused us most uneasiness was the warm summer weather in the town. The thermometer showed 30° and more above zero. Our engines were not tuned to run at such high temperatures. They were built and adapted to function without fail in great cold. Every morning our chief mechanics cast a mournful glance at the flaming orb of the sun, the motionless leaves of the trees and the white dresses of the Archangel girls. The whole town was delighted with the unusual sub-tropical weather, but our mechanics dejectedly shook their heads. They were afraid that at such temperatures it would be extremely difficult to take off; the engines might boil and stall. So they mercilessly tore off all the heat-insulating covering from the oil and petrol leads and the engine bonnets; but they were still doubtful of success.

Moscow informed us that the squadron was expected to arrive on June 25th. The aeroplanes were to land at 5 p.m. sharp on the concrete flying-field of the Moscow central aerodrome. We would have to start at 11 a.m. at the very latest. However, this would mean that we should have to fly during the very hottest period of the day and



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General view of the ice-floe on which the Polar Station was set up *Left* Shevclev and Schmidt

risk difficulty with the engines. Schmidt convened the chief pilots, discussed the situation that had arisen and then issued his instructions:

"All to the aerodrome. Start in two hours' time. Direction: Kalinin."

To escape the hellish temperatures of the day the chief of the expedition and the head pilots had decided to fly by night, land at Kalinin in the early morning, wait there until the hottest hours of the day were over and then start for the last sixty-minute hop to Moscow. This tactical operation was worked out with irreproachable precision. The mechanics cheerfully and rapidly prepared our machines for the start when a sudden thunderstorm broke, bringing torrents of rain so that all members of the expedition and the friends who had come to see them off rushed to take refuge under the gigantic wings of the aeroplane, which were wide enough to shelter a considerable proportion of the population of Archangel. Half an hour went by, then an hour; the rain was still pouring in torrents and the precious hours were slipping past. With a gesture of resignation Vodopianov taxied to the start. The rain drummed on the top of the fuselage, flashes of lightning streaked the sky —and among them circled our flagship. The next to take off was Molokov, followed by Alexeiev and Golovin. Our navigating officer noted the time. It was 2.24 a.m. on June 25th. Flying low over the river the aeroplanes fell into formation and steadily proceeded towards the South. Half an hour later the sun peeped through the clouds.

Messages from the flagship came in at short intervals asking for reports on the temperature of the oil and water in the other aeroplanes. The mechanics kept their eyes glued on the thermometers. Everything seemed all right, but all at once we saw that Golovin's machine, proceeding on our port side, suddenly made an abrupt turn and flew

back in the opposite direction. We learned that his engines had been overheated at the start and he was returning to Archangel. He landed on the deserted field, allowed his engines to cool, unloaded everything from his machine, including the crew's personal belongings, emptied his petrol tanks, leaving only just enough to take him to Kalinin, and then hurried to overtake us. Meanwhile the squadron carried on. Below us stretched the unbroken, prickly carpet of the northern Taiga. That green carpet was braided with the intricate pattern of winding roads and the thin ribbon of the arterial highway linking Archangel with Moscow. Countless lakes lay below, looking like saucers full of milk, and wide rivers and narrow streams meandered on their course. Calmly and confidently our navigating officer, Spirin, led the squadron to Kalinin, and our machines touched ground gently on the green field of the suburban aerodrome. Hastily greeting the friends who had arrived to meet us, we hurried to take a dip in the Volga. It was a great pleasure to feel the gentle warm caress of the great Russian river after our long absence.

A short nap, a copious breakfast, last farewells and we were in the air again. We were all smartened up, had changed our clothes and shaved with care. Our travel-worn leather suits were enlivened by snow-white shirts and stylish black ties. Our feet, which had grown accustomed to fur socks and leather boots, were now encased in light shoes.

Mighty clouds were piled up all over the sky and as a result the aeroplanes were jumping high and dropping heavily again. Forests, fields and factories floated by beneath us. How industrial our Soviet country had become. It seemed from above to be full of factory chimneys, timber mills, Soviet farm buildings; it also seemed to be divided up into uniform great squares by the endless acres of the collective farms. We had another thirty minutes to fly

before we reached Moscow. Schmidt was speaking into the flagship's microphone, and his voice, excited and joyous, was relayed by the mighty wireless stations of the capital to all corners of the earth. He spoke of the fame and glory of our great country, and of its devoted sons who were now returning to Moscow for orders to start on fresh ventures.

In front of us Moscow was emerging out of the milky mist. Our aeroplanes hovered over the beautiful even banks of the Volga-Moscow canal. We could see the locks, the buildings of the steamship landing-stages and the steamers themselves. I handed the map to Ritsland, but he threw it down with a laugh: no maps could keep pace with the creative energy of Soviet citizens. These maps did not show the new roads crossing the tundra, the new factories and Soviet farms of the Taiga, the canals linking Moscow with the seas.

The runways of the central Moscow aerodrome loomed up like an enormous cross. The Leningrad road was crowded with people. Our aeroplanes slowly circled over the triumphant city and proceeded to land. The circle was complete: the expedition had come to an end. Motor-cars carried us to the central stand. We saw the familiar faces of Stalin, Molotov, Kaganovich, Voroshilov, Kalinin, Andreiev, Mikoyan, Chubar, Kossior, Zhdanov, Yejov, Khrushchev, Dimitrov, Litvinov, Yegorov, Budenny and others. The members of the expedition passed from embrace to embrace. Stalin, Molotov and Voroshilov congratulated, embraced and kissed each member of the expedition in turn. We were profoundly moved by this unusual reception. Only our native land is capable of such a simple yet splendid welcome.

Chubar, vice-chairman of the Council of People's Commissars of the U.S.S.R., made a speech greeting us in the

name of the Communist Party and the Government. Otto Schmidt and Vodopianov replied, both visibly moved by the marvellous reception.

The meeting was at an end. A mighty cheer for Stalin and for the intrepid airmen thundered over the summer fields. The members of the expedition left the stand and took their seats in motor-cars decorated with flowers.

It was the beginning of a triumphal procession. The motor-cars slowly moved along the Leningrad road. The whole town was in a festive mood, and the welcome given the expedition became a splendid popular festival. All Moscow poured out into the streets and squares.

The motor-cars had hardly reached Maiakovski Square when Soviet Square was already cheering. The Muscovites recognised the familiar and beloved faces of men whose destinies they had followed day by day for three months. With smiles on their weather-beaten, sun-tanned, happy faces the airmen drove about the town with Schmidt at their head. Stalin, Molotov, Kaganovich, Voroshilov, Kalinin, Jdanov, Yejov, Andreiev, Mikoyan, Chubar, Kossior, the leaders of the Party and of the Government drove with the airmen through the streets of Moscow, and were received everywhere with enthusiastic cheers.

The people of Moscow smothered the motor-cars under a rain of flowers. In every square they were welcomed with the music of bands, the thunder of cheers, the lilt of popular songs. A long procession of cars moved along Gorki Street to the Red Square and the Kremlin.

In the great hall of the Kremlin palace, a monster dinner and reception was given, in honour of the members of the North Pole expedition, by the Central Committee of the Communist Party of the Soviet Union and the Government of the U.S.S.R. At the head of the centre table sat Comrades Stalin, Molotov, Voroshilov, Kaganovich, Andreiev,

Mikoyan, Chubar, Kossior, Jdanov, Yejov, Schmidt, Vodopianov, Molokov, Alexeiev, Golovin. Manual and technical workers of the aircraft industry; the constructors, builders and fitters of the engines and aeroplanes of the expedition; the families and friends of the conquerors of the North Pole; the officials of the Northern Sea Route Commission; members of the Academy of Science, of the Central Committee of the C.P.S.U. and of the Government were gathered together in this enormous hall. Others present included Generals Yegorov and Budenny, Marshals of the Soviet Union; Khrushchev, secretary of the Moscow District Committee of the C.P.S.U; the heads of our military and civil aviation; the leading constructors of our aircraft; the directors of aircraft factories; the Heroes of the Soviet Union Lepidevski, Doronin, Slepnev, and others.

On June 27th the Central Executive Committee of the U.S.S.R. decreed that, for the exemplary fulfilment of the task entrusted to them by the Government, and for their heroic work, the members of the expedition which had reached the North Pole and established a Polar station on a drifting ice-floe of the Pole were awarded the following honours:

Title of "Hero of the Soviet Union" with the Order of Lenin:

1. O. Y. Schmidt, chief of the expedition.
2. I. T. Spirin, Major, chief navigating officer of the expedition.
3. M. I. Shevelev, deputy chief of the expedition.
4. I. D. Papanin, chief of the North Pole station.
5. A. D. Alexeiev, chief pilot of the aeroplane N–172.
6. I. P. Mazuruk, chief pilot of the aeroplane N–169.
7. P. G. Golovin, chief pilot of the aeroplane N–166.
8. M. S. Babushkin, pilot of the aeroplane N–170.

A second Order of Lenin:

1. M. V. Vodopianov, Hero of the Soviet Union, chief pilot of the squadron and of the aeroplane N–170.
2. V. S. Molokov, Hero of the Soviet Union, chief pilot of the aeroplane N–171.

The Order of Lenin:

1. M. I. Kozlov, second pilot of the aeroplane N–169.
2. G. K. Orlov, second pilot of the aeroplane N–171.
3. J. D. Moshkovski, captain, second pilot of the aeroplane N–172.
4. A. A. Dogmarov, Party organizer of the expedition.
5. E. T. Krenkel, wireless operator of the North Pole station.
6. P. P. Shirshov, scientific collaborator at the North Pole station.
7. K. K. Fcodorov, scientific collaborator at the North Pole station.
8. A. A. Ritsland, navigating officer of the N–171.
9. N. M. Jukov, navigating officer of the N–172.
10. F. I. Bassein, senior mechanic of the N–170.
11. K. N. Sugrobov, senior mechanic of the N–172.
12. V. L. Ivashina, senior mechanic of the N–171.
13. N. L. Kekushev, senior mechanic of the N–166.
14. D. P. Shekurov, senior mechanic of the N–169.
15. N. N. Stromilov, wireless operator of the N–171, N–166 and N–169.
16. S. A. Ivanov, wireless operator of the N–170.

The Order of the Red Star:

1. L. G. Kruze, chief pilot of the scouting 'plane N–128.
2. B. L. Dzerdzeievski, weather expert of the expedition.
3. K. I. Morozov, junior mechanic of the N–170 and representative of factory No. 24 with the expedition.

4. P. I. Petenin, junior mechanic of the N–170.
5. V. N. Gutovski, engineer assigned to the expedition.
6. I. D. Schmandin, junior mechanic of the N–172.
7. S. K. Frutetski, junior mechanic of the N–171.
8. V. D. Terentiev, junior mechanic of the N–166.
9. D. A. Timofeievich, junior mechanic of the N–169.
10. V. G. Ginkin, junior mechanic of the N–172.
11. V. I. Akkuratov, navigating officer of the N–169.
12. A. S. Volkov, navigating officer of the N–166.
13. M. A. Troianovski, cinema operator.

The Order of the Red Banner of Labour:

1. L. M. Rubinstein, navigating and wireless officer of the scout 'plane N–128.
2. I. G. Kistanov, technician, representing the "Aviapribor" factory.
3. Y. Brezin, mechanic of the scout 'plane N–128.
4. E. G. Radominov, third-class military engineer.
5. L. K. Brontman, special correspondent of *Pravda*.
6. E. S. Vilensky, special correspondent of *Isvestia*.

Money bonuses awards:

(*a*) of 25,000 roubles each: Comrades Vodopianov, Molokov, Schmidt, Spirin, Shevelev, Papanin, Alexeiev, Mazuruk, Golovin, Babushkin.

(*b*) of 15,000 roubles each: Comrades Kozlov, Orlov, Moshkovski, Dogmarov, Krenkel, Shirshov, Feodorov, Ritsland, Jukov, Bassein, Sugrobov, Ivashina, Kekushev, Shekurov, Stromilov and Ivanov.

(*c*) of 10,000 roubles each: Comrades Kruze, Dzerdzeievski, Morozov, Petenin, Gutovski, Schmandin, Frutetski, Terentiev, Timofeievich, Ginkin, Akkuratov, Volkov, Troianovski.

(*d*) of 5,000 roubles each: Comrades Rubinstein, Kistanov, Brezin, Radominov, Brontman, Vilenski.

X

WIRELESS MESSAGES FROM THE NORTH POLE

I

A Letter to PRAVDA

SO HERE WE are at the North Pole. Soviet citizens have reached the northernmost point of the globe. Here, in the very centre of the Polar citadel, in the region towards which the best and bravest representatives of the human race had for so long directed their endeavours, the banner of our great country now proudly waves.

We are proud of the honour which fell to us of discovering the age-old secrets of the North Pole. We will do our utmost to fulfil the responsible and honourable task assigned to us by the Party and the Government. Soviet science will be supplied with the data it requires for the final mastery of the Arctic.

We remained behind to do our work on the North Pole without any anxiety for our fate and confident of success. During the long winter months we will be warmed by the knowledge that we are not alone, but that behind us and with us we have the fraternal millions of the Soviet Union.

Through the intermediary of *Pravda* we send cordial greetings from the Pole to all our fellow-countrymen, to our magnificent Soviet Government, to the Central Committee of the Party of Lenin and to the inspirer and organiser of our victories, Comrade Stalin.

We should like the Soviet Government to name our drifting station on the North Pole after Comrade Stalin.

Until we see each other again, friends, until we meet again. *Ivan Papanin, Ernst Krenkel, Peter Shirshov, Eugene Feodorov.*

2

The Building of the Station

North Pole, June 4th. So our dream of so many years has come true! We are at the North Pole and are staying here to live and work for the triumph of Soviet science. For many decades humanity dreamt of reaching the Pole. We set ourselves the task not merely of reaching the Pole, but of showing the whole world that Soviet technique is omnipotent. And now the aeroplanes sent out by our great Soviet country have reached their goal.

This was possible only because of the high technical level of our country, its brilliant airmen, and the untiring and enthusiastic support of the Government, of the Party and of Comrade Stalin himself.

We spent a year preparing for this winter. As a result of a year's work the station is provided with the most perfect scientific apparatus, magnificent equipment and excellent food supplies. Everything has been newly made, specially for our expedition.

The aeroplanes which flew to the North Pole, in spite of their great carrying capacity, could take only a limited quantity of cargo. For this reason everything was made as light as possible. The outfit of an ordinary winter station in the Arctic weighs about 150 tons, while ours was no more than 10 tons. Everything is portable and yet reliable and convenient. One example will suffice—our main building weighs only about 1,000 lbs.

Our excellent equipment and supplies permitted us to begin our scientific work at the Pole immediately after

our arrival. We began by setting up a meteorological station and a few hours after our landing, the world was already receiving the first weather report in history from the North Pole. Our weather station, despite the rapidity with which it was set up, is solidly built and arranged to function for a long time. We set out all the instruments needed for the observation and recording of the weather and its changes. And so, from the very first day, we began to give four regular weather reports, during every twenty-four hours, to all meteorological stations in the world.

Once we had established contact and given our weather report, we set up our living-tents and busied ourselves with other things. We spent three days waiting for the arrival of the other aeroplanes. During this time we made astronomical observations, investigated our ice-floe, measured the thickness of the ice and, in agreement with Professor Schmidt, decided that it was suitable for the construction of a station. When, on May 26th, Molokov's aeroplane and later Alexeiev's arrived, we enlisted the assistance of the other members of the expedition and began to build our station. We screwed up the frame of our main living-tent, set it up, covered it with the tent-cloth, put skins over this, and moved into it. This tent is warm, roomy and comfortable. Each inhabitant has an aluminium pallet, there is a table, and chairs, and over the table hangs a portrait of Comrade Stalin.

During the next few days we built a kitchen and a shed by the side of the tent. The result was a very passable self-contained flat of three rooms, true, without the amenities of Moscow, but certainly with a sunny aspect —there being no other aspect here in summer. Combining the forces of our Polar station group and the other members of the expedition, we built a great roomy hut of snow, including an engine-room. We set up the wind-motor which



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First Hydrological Station *At the Windlass* AT THE NORTH POLE Ivan Papanin, alongside of him, Mark Troianovski *Standing* Ivan Spirin

was to supply electric energy for our batteries and also six tents for meteorological and gravitational observations and as store-rooms for our scientific equipment. In the very near future we shall set up several other tents, and thus quite a little township will have sprung up here.

All the supplies brought by the aeroplanes—scientific apparatus, food, equipment, clothes, weapons, and fuel—have been carefully sorted, checked and stored in the proper order. Everything proved to be in perfect condition, having stood the transport and the landing on an unprepared aerodrome without the slightest damage. We were especially pleased to see that our scientific precision apparatus was perfectly in order and had not suffered in the least.

A careful study of the drift which we carried out under Otto Schmidt, showed that for the time being we were floating towards the Atlantic. After the arrival of Mazuruk's aeroplane, which has on board all our main hydrological apparatus, we shall be able to determine with greater precision the whole nature of the drift, its laws, its direction and its speed. We are confident in any case that we shall be able to carry out the whole programme of work which we had set ourselves.

Within a couple of days the aeroplanes will start on their return journey. During our flight and our joint life on the ice-floe, we have become greatly attached to the remarkable men of the expedition—courageous, self-sacrificing men of the Stalin mould. They have become our very close friends, and we are very sorry to part with them.

When the aeroplanes go, four Soviet citizens will remain behind on the ice of the North Pole. But even when they are gone we shall not feel lonely, for we know that our whole great country will be following the work of the drifting

station. We are conscious all the time of their enthusiastic support.

Our small but harmonious and single-minded group will work without a pause, on planned, comprehensive lines. Meteorological observations are to be taken every hour. We shall carry out a complete hydrological investigation: take regular measurements of the ocean depths, study the sea bottom, examine the composition, salinity and temperature of the sea-water and of the ice, determine the speed, direction, and force of the currents and study the plankton. We also have a comprehensive programme of astronomical, magnetological and gravitational research. We shall strive to do as much work as possible, for no scientific observations have ever been made here by anyone before us and therefore each observation will be valuable and unique, and will help to raise Soviet science to an even higher level.

A few days after our landing on the ice-floe we received a message of greeting from the leaders of the Party and the heads of the Government. This message moved us profoundly and increased our strength tenfold. How indeed could it be otherwise? We have been entrusted with a great and honourable task, and we will spare no effort to justify this high trust. *I. D. Papanin.*

3

The Warm Current

North Pole, June 6th. The results obtained by the first hydrological station which Shirshov set up on June 4th, proved to be very interesting. He found that a warm current passes under us at a depth reaching from 800 to 2,000 feet. This water has a temperature above zero. Above and

below this current there are masses of cold water with a temperature below zero. Shirshov took sixteen samples of the water at various levels from the surface down to 3,250 feet. These samples have not yet been examined.

As soon as Mazuruk arrived we immediately unloaded his aeroplane and rigged up the hydrological apparatus. Other members of the expedition cut a hole for us in the ice in the middle of the floe, for the lowering of the cable. *I. Papanin, E. Krenkel.*

4

We will Win

To-day, June 6th, we are saying good-bye to our daring comrades who carried out this wonderful flight in order to bring us to the North Pole. We exchanged warm handshakes with Otto Schmidt, with the splendid pilots of our country and their assistants—the mechanics, the vigilant, accurate navigating officers, the wireless engineers and the other members of the expedition to the North Pole.

Our comrades are flying home while we remain on the drifting floe in order to widen the knowledge of mankind, and discover all the secrets of nature at the Pole which up to now have remained hidden from the eye and intelligence of the men of science.

Our task is great and honourable, and we are profoundly grateful to our great country for entrusting to us such an immense and responsible task. We will spare no effort and will use all our energies, all our knowledge and all our experience to solve the important problems with which we are faced. We are far from home, from our fellow-countrymen and friends. Thousands of miles of icy waste divide us from our beloved country, but no distance can ever separate us citizens of the U.S.S.R. from our country, the first Socialist

country in the world, from the people of that country and from the Bolshevik Party.

We are full of energy, strength, and zeal. We are confident that our expedition will be a complete success. We remain here, a small but strong and powerful group. Powerful because we have the backing of the most powerful country in the world. We will win!

When we said good-bye to our comrades we asked them to convey through *Pravda* and *Isvestia* our best wishes to all our fellow-countrymen, with whom our thoughts will ever be during the long Polar nights and days.

We send our best regards, and our deepest affection and devotion, to the great Party of Lenin, and to the leader and friend of the workers, Comrade Stalin. *I. Papanin, E. Krenkel, P. Shirshov, E. Feodorov.*

5

Depth of the Ocean—14,075 feet

North Pole, June 7th. Our position to-day is: 88° 54′ North, 20° West. Our hydrological station took the full depth of the water. This depth proved to be 14,075 feet. A sample of bottom was taken—a small column of greenish-dark-grey silt. The sounding was taken with a hand-operated hydrological apparatus, fitted with an automatic brake. The lowering operation took two hours and forty minutes. It took six hours of continuous work, with all of us engaged, to raise it again.

The temperature distribution was as follows: first a layer of cold Arctic water with a temperature of −1.63°. From a depth of 820 feet and down to a depth of 1,870 feet we found a layer of water with a temperature above zero, reaching +0.77° at a depth of 1,300 feet. Beginning with a

depth of 1,870 feet down to the bottom layers, the temperature becomes continuously lower, reaching −0.70° at a depth of 9,600 feet. The temperature of the bottom layers, however, could not be measured; the thermometers, unable to withstand the pressure of 430 atmospheres in these layers, had broken. *I. Papanin, E. Krenkel.*

6

We are not Feeling Lonely

Letter to Comrade Stalin, Central Committee of the Communist Party of the Soviet Union.

DEAR JOSEF VISSARIONOVICH,

We are happy to inform you that the drifting station at the North Pole has begun its work.

For decades the best sons of the human race have striven to solve the mysteries of the central Polar basin. But it was a task that could only be fulfilled by our great Soviet country which applied its splendid technique to the conquest of the Arctic and began a planned Socialist attack on the North.

Dear Josef Vissarionovich, we are infinitely proud of the great honour accorded us—to be the first to work at the North Pole representing the power and majesty of our Soviet country. We are starting our work with magnificent equipment, with tremendous enthusiasm and an inexhaustible reserve of energy. Living and working tents and storage for food and equipment have already been set up on the ice, and regular scientific research work in meteorology, hydrology, hydrobiology, terrestrial magnetism and the force of gravity has begun. Wireless communication with other Arctic stations has been established and regular observations are being taken of the nature and direction of the drift.

Dear Josef Vissarionovich, here we are in this icy desert, many thousands of miles from our Moscow home but we do not feel separated from our country. We know and feel that our great Socialist mother-country is behind us and with us. This knowledge increases our strength, and we promise you that we will do our best to justify the great trust placed in us. *I. Papanin, E. Krenkel, E. Shirshov, E. Feodorov.*

7

Twenty-four Degrees above Zero

North Pole, June 10th. There was a violent snow-storm on the 8th and 9th which deposited great heaps of snow on our ice-floe. The gusts of wind attained a speed of 60 feet per second. Work in the open was difficult. To-day at 1 a.m. the weather is calm and the sky cloudless. The sun has warmed our tent to 24° above zero, although the temperature in the open is 5° below zero. At present a South-West wind is blowing us towards the North-East and our floe is approaching the Greenwich meridian. Possibly we shall soon find ourselves in the Eastern hemisphere. We have calculated that the average speed of the drift during the seventeen days has been 4.16 miles a day. *I. Papanin, E. Krenkel.*

8

A Sea-gull has Turned Up

North Pole, June 14th. In the evening of June 11th we experienced the first above-zero temperature of our stay in the region of the North Pole; our thermometer registered +0.3°. The days are foggy and windless. This compels us to limit our wireless transmissions, as the resources of our

electric station are immediately dependent on the functioning of our wind-motor.

On our "rest-day" on June 12th we spent the evening very pleasantly; sitting in our cosy tents we drank tea and listened to the music supplied by the gramophone given us by Mazuruk.

On June 13th a sensational event enlivened our stay at the Pole. A sea-gull made its appearance on the drifting ice-floe. We were very pleased to see it. This was the third bird we had seen and it can now be considered an established fact that birds do fly up to the North Pole.

The scientific work of the station is proceeding at full blast. Shirshov has set up a hydrochemical laboratory. He has already examined the first samples of ocean water taken from various levels.

To-day for breakfast we had fresh eggs which we had brought with us in a frozen condition. The weather is now colder. The temperature at present is 7° below zero. *I. Papanin, E. Krenkel.*

9

A Day at the Winter Station

North Pole, June 17th. Soon it will be a month since we came to live on this ice-floe drifting along in the centre of the Polar basin.

Life at the winter station goes with a swing. We hardly notice the passing of the time. This is our day's programme: we get up at 6 a.m., take the first meteorological observations and pass on the results by wireless.

After this we have breakfast and begin the day's work. The sun gives us the same light all round the clock. We notice that it is evening only by our general tiredness and our ravenous appetite. Bedtime is at 1 a.m.

Every day we examine the condition of the ice around our three main food and equipment bases to see whether they are in danger of being separated from us or swallowed up by a crack. Our snow-kitchen could not withstand the heat of our Primus stoves and melted away. We shall build a new one of canvas.

For two days on end we worked at the windlass, setting up a hydrological station. We wished to find out the upper limit of the layer of warm Atlantic water; the results of our investigations are very interesting and we shall give a full report soon. Shirshov is at present working it all out. In our living tent we set up a special table for the water samples brought up from the depths, to prevent them from freezing before being examined. We went in pairs to explore the cracks surrounding our ice-field and found that we were on an island encircled by a channel thirty to thirty-six feet wide.

Fedorov is continuing his magnetological observations. Our dog rushes about the icy expanse with ear-splitting barks, tracking down an imaginary polar bear. "Cheery" has been severely reprimanded for groundless barking and for giving false alarms. *I. Papanin, E. Krenkel.*

10

We Heard the Hum of Chkalov's Aeroplane

North Pole, June 20th. The spring is rather peculiar here. The 18th and 19th of June were foggy, windless days. The slight thaw which has set in gives a foretaste of the coming Polar summer. Wet snow is falling from a murky sky. On our ice-floe everything is wet: there is not a single dry object left. To avoid catching severe chills we are continuously drinking hot tea. We prefer a light frost to such weather.

We shall move the wireless into the living tent as soon as we have finished the necessary preparations. This will probably be in a day or two.

Like other stations, we too have followed with intense interest the daring flight carried out by Chkalov, Baidukov and Beliakov. We were very pleased that we, the northernmost Soviet citizens, heard the hum of their engines and can thus confirm that their red-winged aeroplane passed over the North Pole.

On June 20th we set up a second deep-sea hydrological station. The depth of the ocean at the spot to which our floe has drifted now is 14,350 feet, slightly more than our first sounding, which was 14,075 feet.

Shirshov assumes that the ocean bottom is deeper towards the axis of the earth. It looks as if this will prove true.
I. Papanin, E. Krenkel.

II

A Month on the Ice-floe

North Pole, June 21st. This month has gone by very quickly. The intricate equipment brought by the aeroplanes has been put in order. Each object has its place, and we ourselves have become used to our new conditions. Of course we still have the summer and we have not yet put up the eiderdown roof on our living tent because we are afraid that the damp will affect it.

Before the aeroplanes flew away we cast covetous eyes on them. There were many things in them which would have been useful to us. Our economic manager, Papanin, threatened to send the pilots away without their shirts. The mechanics yielded to our pleadings and gave us much extra tubing and electric flex. We refused nothing and accepted everything with a grateful heart. And yet the

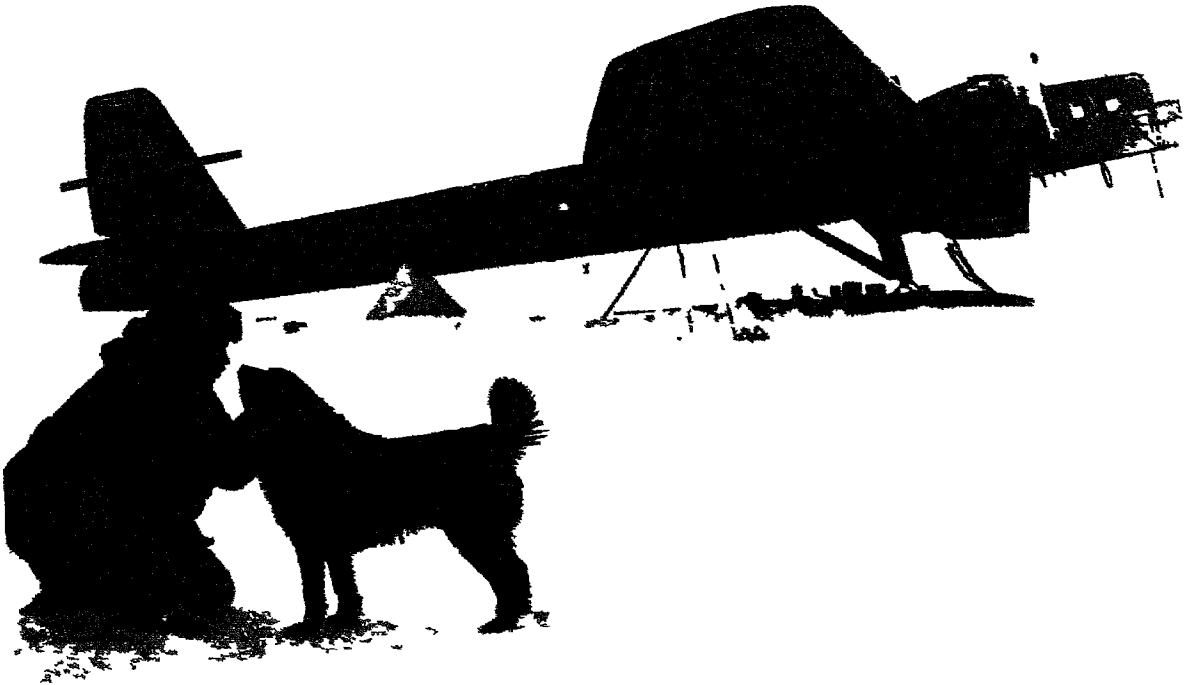
impossible has happened. One of the aeroplanes went off with our frying-pan. And this wound is still unhealed.

Even at the North Pole the preservation of fresh meat is a problem. To the great satisfaction of our dog a hundredweight of meat has gone stale.

Our days are extremely busy. Shirshov and Feodorov spend sixteen hours every day in scientific work, and participate in the ordinary daily routine only in cases of emergency. Krenkel looks after the wireless station and the kitchen and boasts that he supplies our group with both spiritual and material nourishment. All so-called outside work, i.e., the inspection of our stores, opening up of supplies and survey of the condition of the ice, falls on Papanin.

We get up at 6 a.m. and partake of a substantial breakfast. The working-day ends at 10 p.m. We eat our evening meal about 6 p.m. The bill of fare of this meal is far from monotonous. We have five kinds of soup: pea-soup, barley-soup, beetroot-soup, cabbage-soup, and fish-broth. The second course may be kasha (buckwheat porridge), chicken or beef cutlets, fresh pork, fish, green peas or sausages. For the third course we have tea, coffee, cocoa, stewed fruit, or jellies. We think with gratitude of the Institute of Public Nutrition which has given us an ideal assortment of food.

We also think gratefully of the workers of the factories and workshops who made us such first-rate equipment. We thank the "Caoutchouc" factory and its engineer, Maria Mikhailovna Gulbis, for the excellent tent. We are very grateful to the wireless laboratory of the People's Commissariat for Home Affairs for our excellent wireless station. We thank the engineer, Perli, for our excellent wind-motor and automatic windlass. Sometimes we seem to be living somewhere in the steppe. Our ice-floe is so strong that serious pressure effects need hardly be expected. Still, we keep the old cracks under careful observation, and several



21 PAPANIN AND THE DOG AT THE POLE

empty sledges are always kept ready to shift our bases in case of necessity.

Our two deep-sea stations indicated depths of 14,075 feet and 14,350 feet respectively. We guard the samples of the ocean bottom like the apple of our eye. All four of us participate in this work, the total weight of samples brought up amounts to about 180 lbs.

It took us six hours to raise the first lot of samples and four hours the second. Our "doctor" Shirshov takes care to give us enough exercise in the open air. He is our first-aid man, but since he once told us that his first-aid would probably also be the last we are careful to avoid invoking his medical assistance.

We communicate with Rudolf Land by wireless four times a day, and get into touch with Cape Jelaniya, Pacific Bay and Barentsburg as need arises.

We are still getting an enormous number of telegrams of congratulation from all parts of the U.S.S.R. As we have no possibility of replying, we wish to thank them all through *Pravda*. We shall spare no effort to justify the trust placed in us by our country. *I. Papanin, E. Krenkel.*

12

Life Flows on Evenly

North Pole, June 22nd. To-day for the first time we looked up at the clear cloudless sky with a feeling of hostility, almost of annoyance. Had we had this weather the day before yesterday, this last spot of Soviet country would have been visible to the ANT–25, and we, its inhabitants, would have been able to see our heroes' red-winged aeroplane on its course.

"Well, it's your own fault," Papanin jokingly taunted Shirshov and me, "you concocted a damp fog and low-

lying cloud when we wanted a cloudless sky. And you call yourselves weather-makers!"

Yes, we would have given a great deal to have been able to substitute to-day's cloudless sky for the murky weather of that unforgettable day. But our ears, accustomed to the hum of aircraft engines, still retain the drone of Chkalov's engines. Even though we could not see the machine we heard the triumphant song of his engines over our ice-floe. And we knew that at the same time as we were trying to see them, Chkalov, Baikulov and Beliakov were striving to see us through the clouds.

We have been discussing nothing but this flight. If you on the mainland discuss it constantly you can imagine how it interested us in our tiny Soviet settlement, where there is little enough news. That is why we were all furious to-day at the clear weather—to-day this high cloudless sky and complete calm are of no use to us.

Ernst Krenkel kept on duty at his receivers for thirty-six hours on end to follow the heroic crew who boldly blazed their victorious trail across the sky.

"Never mind!" Krenkel consoled himself and us. "We shall see other Soviet wings over the Pole before long."

We are quite convinced of this. Why, we have passed only a month of our life at the Pole, and we have already heard the drone of an aircraft engine over our heads. When the aeroplanes of our squadron left the ice-floe we thought that our next encounter with an aeroplane would not take place for another year—when they would return to take us off.

Meanwhile our life runs its even course despite all great events. To-day we measured the depths a second time, and took magnetic observations.

We are drifting along together with enormous masses of ice and are penetrating ever further into an uncharted ocean. What could be better than this? *E. Feodorov.*

13

Building Goes On

North Pole, June 24th. The second month of our life on a drifting ice-floe in the region of the North Pole has begun. All this time we have been doing our scientific work and each day the entries in our observation diaries require a greater and greater number of pages.

True, the last two days we spent somewhat less time in scientific research, as Papanin commandeered all hands for the reorganisation of the camp. The position is, that the June weather is making itself felt even in the North Polar region. The snow is melting and the resulting water is finding its way into the tents. The snow-huts were also not equal to summer temperatures and sunk lower and lower each day.

Having mobilised all forces for the job Papanin first of all decided to raise the living tent and place a flooring of boards underneath it to protect the canvas from being soaked through. Then we transferred Krenkel's wireless-station to the living-tent. Had we not done so our wireless-station would very soon have found itself under the open sky, for the snow bricks of which the walls of the wireless-station "building" had been erected were shrinking at a rate visible to the naked eye.

Now all Krenkel's gear has found a place in our living-tent on a convenient and comparatively roomy table. The loud-speaker was hung up under the ceiling and through it Krenkel often offers us the opportunity of listening in to concerts from Moscow.

The previous day we spent in preparing ice anchors for the masts of the aerial. Yesterday the masts were erected on a fresh spot and are now anchored far more solidly than

before. Krenkel was very pleased with the new arrangement of the masts and aerial because audibility has been considerably improved. This in itself of course pleased all of us, but we were sorry that to achieve this result we had to give Krenkel 300 yards of cable from the reserve stock.

To-day we are busy transferring our wind-motor to another spot. We dug nearly three feet into the ice to fix the guys of the windmill. We used two food cans for the substructure. Now we feel quite sure that even the strongest gale cannot overturn our power station, which magnificently supplies our camp with free electrical energy.

The latest message by wireless informs us that to-morrow, June 25th, the aeroplanes of our expedition will return to Moscow. When you see our comrades, you can tell them that if they were to return to our camp to-morrow they would not recognise it. Since their aeroplanes left the North Pole station our camp has altered considerably, and has been moved nearer to the centre of the floe. On the old spot we left only the meteorological hut perched on the top of a high block of ice. *P. Shirshov.*

14

Our First Contact with a Wireless Amateur

North Pole, June 25th. On June 22nd we transferred all our wireless equipment from the snow hut to the living-tent. Our aerial points towards Rudolf Land and this change has much improved audibility. We can also hear the Comintern station much better now. We regularly listen in to the précis of the Moscow morning papers.

Our snow hut served us faithfully for nearly a month. One hour after we had taken the last piece of wireless apparatus out of it the walls of the hut collapsed.

Our tent is warm and dry. The absence of damp also

tends to improve the audibility of the wireless transmissions. The loud-speaker has spoken for the first time here, even though it is not very loud. We listen in to the concerts broadcast from the Scandinavian countries and the short-wave transmitters of Paris and London.

On June 24th wireless connection was established for the first time with an amateur, a Norwegian in Aalesund, a locality of approximately the same latitude as Leningrad. This makes us confident that in the near future we shall be able to establish contact with short-wave amateurs of our own country. *I. Papanin, E. Krenkel.*

15

Blizzard

North Pole, June 27th. On June 23rd we transferred our remarkable wind-engine to a spot nearer to our tent, and anchored it very solidly. At 2.45 p.m. a violent blizzard swept our floe, piling the snow high on top of our tents. We did not sleep all night, listening to the moaning of the wind and going out frequently to examine our supply bases. The outside temperature was 2° below zero, and the temperature inside the living-tent 4·8° above zero.

We have begun regular communication with wireless amateurs on the wavelength of 20–40 metres. Our call symbol is UPOL, and we usually transmit from 10 p.m. to 12.30 a.m. Moscow time. *I. Papanin, E. Krenkel.*

16

Life at the North Pole

North Pole, June 28th. The sun is gleaming dimly through a dense, damp fog. For several hours a lovely bright rainbow

shone over the ice. The temperature of the air was zero. When walking we sink into the wet, melting snow. We keep watch all round the clock and certainly find it an advantage that the sun is also up all the time.

Everybody is busy with his own job. In order to make his hydrological work more convenient, Shirshov has built a snow-hut over his deep-sea apparatus. Vodopianov's parachute, which first did honourable service on the aeroplane, and was then used as a roof for the wireless station, has now been transferred to Shirshov's hydrological hut. Papanin has been working hard, arranging our precious fuel reserve. We had to use a syphon to get the paraffin out, because the pump failed to work. In sucking out the air from the syphon Papanin swallowed a huge mouthful of paraffin. We had to render him first-aid in the shape of chocolates and cigars.

Our wireless contact with the world is growing closer and firmer all the time. With bated breath we listened in to the meeting at the Central Aerodrome in Moscow welcoming the return of the Schmidt-Vodopianov expedition. We could even recognise Schmidt's voice; the cheers carried all the way here from Moscow. That evening we got in touch with Dickson and heard all the details of the reception. Of course, we would have liked very much to see it all—the aerodrome and the capital—if only with one eye. We are deeply moved by the tremendous attention paid to the expedition by the whole country and by Comrade Stalin. We shall do our best to justify the great trust placed in us.

Schmidt informed us that at the banquet in the Kremlin Comrade Voroshilov toasted our group of four. We thank Comrade Voroshilov very much. We will at any time be ready to settle anywhere we may be asked to go in the interests of our country.

In our leisure hours we can now already carry on conversations from the Pole with short-wave amateurs in a great number of countries. During the night of the 26th we had a wireless communication from a French amateur who told us that he could hear our Polar wireless station very well. Towards morning come the Brazilians and Hawaians; at about 5 a.m. we get a deafening American broadcast and at seven o'clock we establish contact with an American short-wave amateur living in New York. The short-wave amateurs mostly transmit congratulations and seem very pleased to get this unique contact with the North Pole.

We are impatiently awaiting the moment when we can at last get in touch with Soviet short-wave amateurs. The first amateur to talk to the North Pole will receive as a present Krenkel's own wireless receiver, which he deposited for that purpose in the offices of the journal *Radiofront*.

I. Papanin, E. Krenkel.

17

Stormy Weather

North Pole, June 29th. A savage North wind has been raging for more than twenty-four hours. Our tent is trembling under its blasts. Rain has been pouring down for hours. Below us to a depth of 14,000 feet is the salt water of the Arctic Ocean, and above us, it seems as if someone had opened the sluice-gates of all the fresh water in the world. Under our feet is snowy slush.

The wind is considerably speeding up our drift. We are moving towards the northern coast of Greenland. The next astronomical observation will probably be very interesting.

We are faced with the very intricate problem of how to dry our shoes and clothes. But we hardly notice these little troubles of life: we are so pleased at the honours awarded

us by the Government that we feel as if we have sprouted wings. *I. Papanin, E. Krenkel.*

18

We Hold Sacred the Honour of Our Country

North Pole, June 30th.

Comrades Stalin and Molotov,

Central Committee of the Communist Party of the Soviet Union,

Moscow.

DEAR JOSEF VISSARIONOVICH AND VIACHESLAV MIKHAILOVICH!

Our group of four has received with pride the news of the high honour awarded us. There are many difficulties ahead, but we shall not forget that the country expects great things from us, that we are surrounded with your loving care and that the interest of the whole country is with us.

We will spare no effort to justify your confidence and to hold high the honour of our country under all circumstances whatever they may be. *Papanin, Krenkel, Shirshov, Feodorov.*

19

The First Results of Our Scientific Work

North Pole, July 3rd. From May 21st to June 5th our ice-floe drifted at an average speed of four miles a day and the general direction of the drift was towards the South and West (in relation to the Greenwich meridian). Since June 5th we have been drifting in zig-zags, now East, now West, over a limited region between 88° 30′ and 89° North and 0° and 30° West. The greatest observed speed of the drift was 0·4 miles and the lowest 0·05 miles an hour. In general

the drift of our ice-floe follows the direction of the wind with a slight deviation to the right owing to the movement of the earth.

We determine our position every day with theodolites, the margin of error being about a quarter of a mile. Meteorological observations are taken four times a day. From June 10th onwards we have been keeping a daily record of the weather. The average temperature of the last ten days in May was −9°. The lowest temperature was observed on May 26th when the thermometer showed −16°. From May 30th on the weather has been growing warmer.

The average temperature in June was −2°. The highest temperature observed was +1° on June 11th. From May 22nd to June 5th the dominant winds were North and North-West. From June 5th to June 14th winds were mainly South and South-West; from the 16th to the 20th, North and North-East; from the 20th to the 25th South and lately North, with a velocity of 7 metres per second. The greatest velocity observed was over 16 metres per second. South-East and East winds were the most infrequent.

Hydrological work began on June 6th after we had received the deep-sea apparatus.

The depth of the ocean at 88° 54′ North and 20° West was 14,075 feet; at 88° 47′ North and 10° West it was 14,350 feet. Thus the bottom of the ocean dips down towards the East, growing 275 feet deeper in a distance of fifteen miles. Two samples of the bottom have been brought up.

All samples of water taken from various levels have been examined in the hydro-chemical laboratory. The main results are these: from the surface down to a depth of 490 feet the temperature of the water is 1·63° to 1·70° below zero, and its salt content is low. At lower levels the temperature rises quickly and is close to zero at a depth of 825 feet. Between 900 and 1,970 feet we found the water tempera-

ture above zero and salt content high. The highest temperatures were found at a depth of 1,300 feet. Temperatures here were + 0·71° to +0·78°. At depths beyond 2,450 feet temperatures are again below zero. Between 6,500 and 8,200 feet they were −0·84° to −0·87° and near the bottom −1·23°. Salt content near the bottom was 35.01.

Thus it is found that the Atlantic waters discovered at more southern latitudes by Nansen reach the region round the Pole in a mighty stream, bringing a considerable amount of heat to the central basin of the Arctic Ocean. The results of consecutive tests throughout the twenty-four hours are very interesting. For twenty-four hours we took water samples every two hours at depths of 650 feet, 825 feet, 900 feet, 975 feet and 1,300 feet. At 825 feet we found periodic variations of temperature and salt content of quite considerable magnitude. These variations point to some internal movement of the waters within this layer, possibly of tidal origin.

A provisional microscopic examination of the plankton collected from various depths has shown that in the upper layers of the ocean the hydrobiologic winter still continues. The mass growth of the microscopic water-plants of plankton, the so-called "flowering" which is characteristic of the biological spring, has not yet begun. But it is already quite obvious that Nansen's notion of the great scarcity of life in the central part of the Arctic Ocean is quite incorrect. The plankton net hauled up from a depth of 3,250 feet was literally crawling with all sorts of molluscs, medusas and crabs with the bright red colour characteristic of the denizens of the lightless deep.

A determination of the elements of the terrestrial magnetic field was carried out with the magnetic theodolite at four points of our route. The measurements taken show that the magnetic field is of a uniform character and that there are



22 HEAD OF THE EXPEDITION, OTTO SCHMIDT, BEFORE THE DEPARTURE FROM THE POLE FOR RUDOLF LAND

no major anomalies in the region of the North Pole. The magnetic meridian deviates from the Greenwich meridian 41° to the West.

The force of gravitation was determined at 88° 58′ North and 29° West and at 88° 49′ North and 5° West. The measurements were taken with a pendulum apparatus constructed by the Astronomical Institute of Leningrad. Preliminary calculations indicating similar results for both points show a considerable deviation from the normal distribution of the force of gravitation. This extremely interesting phenomenon will be the subject of further detailed research.

During the gravitational, magnetic, and astronomical observations we perceived no movements of the ice of any kind.

Our wireless station communicates with Rudolf Land with perfect regularity four times a day. The power of our transmitter is 20 watt. We transmit on long wavelengths and use a sixty-metre wavelength only in the event of atmospheric disturbances. Strong atmospheric disturbances were observable during two days. We hear most of the small stations around the Kara Sea. We have now established contact with amateurs in Leningrad, Norway, France, England, Ireland, Iceland and North America. Audibility is about 55 per cent of the possible.

In future we shall give reports of our work at the end of each month. Greetings. *Papanin, Krenkel, Shirshov, Feodorov.*

20

The Banquet

North Pole, July 2nd. On June 28th at 6 a.m. a wireless message from Moscow informed us of the honours awarded to the members of the North Pole expedition.

Audibility was very bad and we could not distinguish more than a few familiar names. We heard all details at 1 p.m. from Rudolf Land. We were all very pleased and heartily congratulated each other.

That evening we held a banquet in the kitchen tent. We had cake, washed it down with brandy, and then washed down the brandy with lemon juice. The first summer shower drummed on our tents, but the abominable weather did not worry us in the least.

Schmidt sent us a message of congratulation and we are receiving innumerable greetings from organisations, friends and relatives. *Papanin, Krenkel, Shirshov, Feodorov.*

21

The Traffic Lights are Lit

North Pole, July 17th. Our tiny tents are almost invisible among the ice-blocks and cracks. So we painted a red circle 490 feet in diameter to make it easier for Comrade Gromov to find us. Unfortunately fog and low-lying cloud prevented the crew of Gromov's aeroplane from throwing us down letters and newspapers.

As they flew over the Pole, the crew sent us a greeting: "A greeting to Papanin, Krenkel, Shirshov, Feodorov, conquerors of the Arctic, from the crew of the aeroplane ANT-25 Gromov, Yumashev, Danilin."

We heard with the greatest pleasure of the new record set up by Comrade Gromov. We are glad that our weather reports were of some help to our splendid Soviet airmen's flight.

The traffic lights are lit at the crossing of all meridians. A hearty welcome to all. *Papanin, Krenkel.*

22

Two Months on the Ice-floe

North Pole, July 21st. To-day we complete the second month of our stay on the drifting ice-floe. We have become used to our surroundings and have completely adapted ourselves to local conditions. Our whole mode of life is subordinated to our fundamental aim of carrying out as many scientific observations as possible.

At first all scientific observations were novelties for us sometimes running counter to accepted academic theories. But now our scientific work has reached a higher stage. Our young scientists, Shirshov and Feodorov, having registered the peculiarities of this region, are investigating points of special interest in greater detail and are carrying out additional scientific work.

The final result of all our work will be an exact, unassailable and irrefutable description of the central part of the Polar basin.

We have collected a great deal of scientific material already, and we hardly manage to keep up with investigating it all. The limited quantity of containers, for example, frequently compels Shirshov to work all round the clock in order to free his containers for the next lot of material.

It is now already confirmed beyond doubt that animal life exists even at a depth of 9,840 feet. It would be a crime not to preserve specimens of this fauna.

Through a bit of annoying negligence our entire supply of alcohol, indispensable for this sort of work, was left behind at Rudolf Land. Shirshov has solved the difficulty by distilling alcohol from brandy.

When Shirshov and Feodorov are asleep, we take the observations.

The daily camp routine takes up much time and energy and is dealt with entirely by us two.

The pools forming on the ice-floe have compelled us to transfer our reserve bases to new positions. We have to carry tons of stuff about, wading up to our knees in water. Papanin cuts ditches to drain the water into our hole through the ice; carries snow to cover our tents, and is always oily and greasy from eternally repairing the Primus stoves.

We also have to find time to prepare our food and to bring up ground samples from a depth of over 14,000 feet which, the four of us working together, takes some four hours. All the time we must keep track of the time in order not to miss the hours for the regular weather report transmission and general wireless communication.

The enormous parcel of books we brought with us will obviously remain unread. We just cannot find time to read.

Wireless messages take the place of books and newspapers. So our life is nevertheless full of colour and interest. The wireless messages from various organisations and our friends give us very great pleasure, and we request them all to send us messages as often as possible. *I. Papanin, E. Krenkel,* Heroes of the Soviet Union.

23

Flood

North Pole, July 29th. During the last fortnight we were completely becalmed in an anti-cyclone. The drift stopped almost completely. Our wind-motor did not work because there was no wind. In order to save our batteries we stopped all wireless communications with the exception of regular weather reports.

A thick fog prevented Fedorov from taking astronomical observations during six whole days. Only to-day he

succeeded in determining the position of our ice-floe: we are now at 88° North and 8° West. That is to say, our ice-floe is still in the "other" hemisphere.

The warm weather has rapidly thawed the snow, and the ice-floes are covered with pools. Our reserve bases are perched on islands of ice. Just in front of the entrance to our tent there is a raging torrent on a small scale, about five feet wide and eighteen inches deep. We have used it to test our canoes and inflatable rubber boat, which can carry a ton of cargo. The whole fleet proved to be of excellent quality. As a side-line we studied the bed of our brook: at certain points we found no bottom with our oars.

Our cooking is considerably simplified by the plentiful amount of fresh water, which also saves us a lot of fuel. Formerly we had to melt snow if we needed water. Nevertheless, we are getting fed up with the deluge and we are waiting impatiently for frost. We have tried out our stoves and paraffin lamps and found that they heated the air inside the tent very well.

We have great difficulty in finding enough snow to cover our tents. We had to search the whole North Pole for it and bring it from a distance on sledges. For the time being our living-tent is standing on an ice pedestal and we are taking heroic measures to preserve it. Yesterday, we had the first fall of wet snow and were very pleased. *I. Papanin, E. Krenkel,* Heroes of the Soviet Union.

24

A Letter to all Polar Workers

North Pole, August 1st. We are receiving a great many messages of greeting from Polar workers. We would like to answer them through *Pravda.*

DEAR FELLOW-WORKERS,

Accept our heart-felt thanks for your kindness. We are all working at the same job. We have been singled out for the high honour of living and working on the drifting ice of the North Pole, but we know that any of the Soviet Polar workers could do the job just as well as we can.

All of us who work on Polar Stations have often thought of that white spot on the map called the North Pole, towards which humanity has striven for many decades. The forces of mighty Soviet technique, directed by the will and intelligence of the Party and the Government, have conquered the Pole. In co-operation with you, by the united effort of all Polar workers, we will wipe that white spot off the map of our earth.

Greetings to you, dear friends! *I. Papanin, E. Krenkel, P. Shirshov, E. Feodorov.*

25

Scientific Observations in July

North Pole, August 5th. We give the results of the work done on the drifting ice-floe in July. During our stay on the ice the drift can be divided into two different periods. During the last decade of May the drift showed an average speed of four miles a day, and its direction was approximately South and towards the Greenwich meridian. In June and July the drift set in the same direction, but its speed decreased to a mile and a half per day. In June we moved thirty-six miles and in July, forty miles.

By comparing the route of the ice-floe as determined by astronomical observation with the direction and speed of the wind we could determine the direct influence of the wind by the Sverdrup method. At the same time the ice is being moved by a constant current towards the South-

East at a speed of a mile and a half a day. The results of the working out of the regular water-meter observations will give a more detailed picture of the connection between wind and ice drift.

The mean temperature of the air in July was +0·2° with a maximum of +1·7° and a minimum of −2°. At the end of July the snow covering, which had a thickness of sixteen inches, melted away completely, laying bare the uneven surface of the ice-field and forming large fresh-water pools. The surface of the ice is furrowed by old cracks frozen up again. The nearest pools were drained off into the sea through our hydrological hole. After the snow, the surface layer of the ice began to thaw, and the ice separated into large grains similar to snow. The thickness of the ice layer that melted away is about ten inches. During the last few days the thawing has very much slowed down, and the flow of water is hardly noticeable. During the first half of July there were several days with little cloud, but the second half of the month was almost completely clouded over, with frequent fogs and rain.

Bad visibility considerably hampered astronomical and magnetic observations. In July we began the study of magnetic variations. We succeeded in determining thirty-three position lines and we did three twenty-four-hour series of calculations of the magnitude of the deviation and the horizontal component. Measurements of the magnitude of the magnetic elements were taken at four points. At each point during the measurements variations were calculated during several hours. In this way the measured magnitudes can be reduced to a certain mean value.

Gravitational measurements were taken at one point, the co-ordinates of which were 88° 8′ North and 5° West. Preliminary calculations of the gravitational acceleration here reveal a positive anomaly. At the beginning of July

during two days of comparatively clear weather we succeeded in carrying out observations of atmospheric electricity. During July we made five hydrological examinations —one at the upper limit of the Atlantic current (which lasted a day and a half) and four deep-sea investigations. At a sixth point (88° 6′ North and 4·5° West), we took a third sounding and found the depth to be 14,420 feet. Thus the bottom of the ocean continues to slope downward along the course of our drift, but the slope is now less steep. Between the first and second soundings (a distance of fifteen miles) the increase in depth was 275 feet. But between the second and third soundings (a distance of forty miles) it was only 70 feet. The bottom here showed two layers, an upper layer coffee-brown in colour, and a lower grey stratum.

The deep-sea soundings were more successful in July than in June. We were successful in selecting thermometers which could stand the pressure of the water at great depths. The temperature of the water near the bottom proved to be considerably higher than the reading shown by the only retrieved damaged thermometer at the second deep-sea sounding. The temperature at a depth of 14,390 feet was −0·67° and at a depth of 13,125 feet −0·72°. Consequently, the general situation seems to be this: at depths of 825 to 1,975 feet there is a warm stream of Atlantic origin with temperatures above zero. At a depth of 2,475 feet the temperature is approximately zero; then the temperature falls gradually until it reaches its minimum at depths of 8,250 to 9,850 feet, where the temperature lies between −0·82° and −0·84°. At greater depths the temperature rises again and near the bottom this rise amounts to two-tenths of a degree.

During July we carried out several series of water-meter observations of the speed of the current in the layer of



23 BEFORE THE FLIGHT OF THE 'PLANES FROM THE NORTH POLE

Peter Shirshov (*right*), a member of the party to winter at the Pole runs to Vodopianov's 'plane, which is taking off

Atlantic water. The observations were taken with two Eckmann-Mertz water-meters, which were lowered simultaneously on the same cable to various depths. The lower water-meter was sunk to a depth of 3,280 feet, i.e., into a layer of water with no trace of the warm current. The upper one was lowered 1,300 to 1,640 feet into the stream of Atlantic water. We also carried out two deep-sea plankton examinations, bringing up plankton from various levels from a depth of 13,000 feet to the surface. Life at a depth of 13,000 feet is much scantier than at higher levels, but is still well represented by various plankton specimens. During the last decade of July we observed an appreciable development of vegetable plankton in the upper layers of the ocean, marking the beginning of the hydrobiological spring. A peculiar manifestation of life was the yellowish-red colour of the snow on one ice-field, caused by the development of microscopic water plants. This interesting phenomena, which has been frequently observed in the ice of more southerly latitudes, is as yet a rarity here. *I. Papanin, E. Krenkel, P. Shirshov, E. Feodorov.*

26

Three Bears at the Pole

North Pole, August 7th. It is raining again. The rain drums down on the taut roof of our tent, the wind is howling in the guy-ropes, and our wind-motor is creaking monotonously, charging our batteries with energy. In such weather it is good to sleep in a warm fur sleeping-bag, think over the results of scientific observations, make plans, remember and dream. . . .

At 3 a.m., during Ernst Krenkel's watch, he put his head through the tent door and shouted excitedly:

"Three bears!"

A white she-bear with two cubs was approaching our camp from the North-West. They came cautiously nearer, examining with curiosity and alarm the unusual structures which had appeared in the kingdom of ice. The revolving windmill and the sudden appearance of a man and a dog frightened the beasts and the whole family turned tail.

Krenkel followed them and sent a shot after the fugitives. Papanin ran after Krenkel while Shirshov and I put on skis. Our dog tore loose from his leash and rushed along, overtaking us all. We soon lost sight of the dog. Pursuit was vain; the bears were lost in the low-lying fog between the ice-blocks.

We returned; Krenkel resumed his watch while we crept back into our sleeping bags. Three hours later our dog came back tired out by the pursuit. He was dreadfully ashamed of his failure, whined guiltily and rubbed against Krenkel's legs. *E. Feodorov.*

27

The Drift of Our Ice-Floe

North Pole Station, August 31, 1937. (From our Special Correspondent.) Astronomical observations provide the basis for studying our drift. Of course it is necessary to have as large a number of observations as possible in order to draw up an exact chart of the drift. Therefore Feodorov "takes the sun" every time it is gracious enough to look down through the constant veil of cloud.

For the first twenty days of our stay on the ice-floe it seemed to us that the drift was due purely to the wind. In May and early June, North and North-West winds prevailed; during this period the ice-floe drifted with the wind —to the South-East, with a slight deviation to the right

resulting from the rotation of the earth. But later in June and in July, winds blew from various directions, and there was no prevailing direction. In spite of this, the drift maintained its original direction towards the South-East, although the speed slowed down.

Feodorov compiled, parallel with his drift chart, a record of wind direction. If the drift had been determined purely by the wind, both charts would have coincided. But this was not the case. Evidently, in addition to the wind, a permanent current was also governing the movement of the ice. Using the Sverdrup method, we succeeded in determining its influence. The current was flowing to the South-East; its speed was a mile and a half a day. Whether its direction and speed were constant, or whether the current was of a seasonal character, the future would show.

Having measured the current, we succeeded in determining the coefficient of dependence of the speed of the drift on the velocity of the wind. It must be stated that the speed of the drift is directly dependent on the velocity of the wind, the coefficient being 0 13. This means that wind with a velocity of 0·1 metres a second produces a movement of the ice at a speed of 13 millimetres. As a result of the influence of the rotation of the earth the direction of the drift deviates 40° to the right of the direction of the wind.

Astronomical determinations give a summary picture of the drift of the ice. To secure a more detailed picture of the drift, regular observations were taken with a water-meter. In order to obtain the speed of the drift, the water-meter can be lowered to a depth at which there are no signs of any current. At first we lowered it to 2,475 feet, i.e., below the layer of Atlantic water. Then a series of observations were taken with two water-meters lowered simultaneously

to different depths. We sank the lower one to 3,300 feet, and the upper one to 1,300 to 1,600 feet, i.e., within the layer of Atlantic water. But the water-meter showed no current in this layer. Consequently, for our purposes we could take a depth of 1,300 feet as a practically immobile layer. This considerably reduced our labours in raising the water-meter.

At present we have no time to work out the water-meter observations but even now it is possible to note a number of interesting points. It is curious to follow how the drift turns under the influence of the wind. Thus for example on July 13th and 14th the wind turned 320° anti-clockwise from North-West to East. Following the wind, the line of drift described a closed loop with a radius of about half a kilometre. Between the 4th and the 6th of August the wind changed 180° from South-West to North-East, and again the drift described a loop with a radius of about a kilometre.

With varying directions of wind and drift, the latter maintained its course, not always with equal speed. In many cases the line of drift turned very sharply under the influence of the wind (deviating, of course, a little to the right); this created the impression of complete absence of inertia of the ice. However, in a number of cases the drift changed its direction with extreme "reluctance". On August 3rd, for example, in spite of a South and South-East wind blowing with a velocity of 6 to 7 metres a second, it took a whole day before the drift made a smooth turn from an Easterly to a Northerly direction. It is not difficult to see why this should be so: the drift turns quickly in the direction of the constant current (sideways to the latter). Against the current, and even at any considerable angle to it, the direction of the drift changes extremely slowly. Cases of drift in the form of leaps are also accounted for

by the resistance of the current. On the 18th and 19th of July the speed of the drift at one time fell to nil, at another rose to 0·1 metres, in spite of a constant North-East wind of a velocity attaining 5 to 7 metres a second. On the night of July 19th the drift ceased altogether, although a steady East wind was blowing. It was evident that to the West of us the drift had been held up by ice moving in the opposite direction. In some cases the turn of the drift is against the turn of the wind. The wind was observed to change three or four hours later. In such cases evidently a change of wind, taking place earlier at some point outside our region, was influencing the drift.

It was interesting to see what layer of water was drawn along by the drift of the ice. A movement of the ice, produced by the wind, as a result of the force of friction caused a movement of the water in its upper layer. This movement in its turn brought about a movement of the deeper layers of water. The speed of the movement, however, diminished with the depth, in relation to the speed of drift of the ice.

We carried out our observations with the help of two water-meters, lowered to various depths in succession. As was to be expected, the drifting current affected a relatively thin layer of water. At a definite speed of drift (0·1 metres a second), the drifting current was clearly marked at depths of 15, 30 and 75 feet. But by 150 feet it was already imperceptible. It is extremely interesting that at depths of 15, 30 and 75 feet the direction of the current does not coincide with the direction of drift of the ice. As a result of the influence of the earth's rotation, the drifting current deviates with its depth more and more to the right. Hence we draw the conclusion that there is a depth at which the current is moving in an opposite direction. But to determine what this depth is further observations must be made.

P. Shirshov.

28

One Hundred and Ten Days on the Drifting Ice-floe

North Pole, September 7th. We have now been working 110 days on a drifting ice-floe in the Arctic Ocean. Before we could open a station here we had to do a tremendous amount of preparatory work. An extensive aviation base was built on Rudolf Land. Special heavy aeroplanes were adapted, and the entire equipment for our station was newly produced, from beginning to end; also special food supplies were prepared.

The main technical requirements to which all objects intended for this Polar venture had to conform were minimum weight with a maximum of solidity and reliability. The usual Polar station staffed by four persons, if set up on a new spot, needs an equipment which with one year's supply of food weighs about 200 tons. Our limit was 9 tons including the weight of the men and even that of our dog, which was estimated to weigh some 65 lbs.

An enormous amount of labour was expended on all this. Was this labour justified?

Many people doubted whether our venture would be successful. Many people thought that even the landing of heavy machines on an improvised aerodrome would be impossible and proposed that all the equipment of the station should be dropped by parachute. However, our Soviet airmen brilliantly refuted this idea again and again by their numerous successful landings with heavy machines in the region of the North Pole. The first aeroplane piloted by Comrade Vodopianov, as well as all the other machines, landed and took off from the ice without a single case of damage. The entire equipment of our station arrived at the North Pole in apple-pie order and we began our

scientific work without the slightest delay as soon as the cargo was unloaded.

The possibility of exact scientific measurements on a drifting ice-floe was also denied by many.

The frequent formation of pack-ice, the development of cracks, and camp-life itself, all seemed to require that we should restrict ourselves to only the most important observations. Our plan of work seemed far too ambitious to the experts. However, we are successfully getting over all difficulties and have been able to carry out all scheduled observations on an extensive scale.

We were subjected to much inconvenience by the summer water. The intense thaw made necessary a constant shifting of all our "laboratories", and the blizzard tore fiercely at our light-weight tents. Our hydrological instruments required a lot of manipulation to prevent them from freezing. After each blizzard we had to reorganise our whole camp.

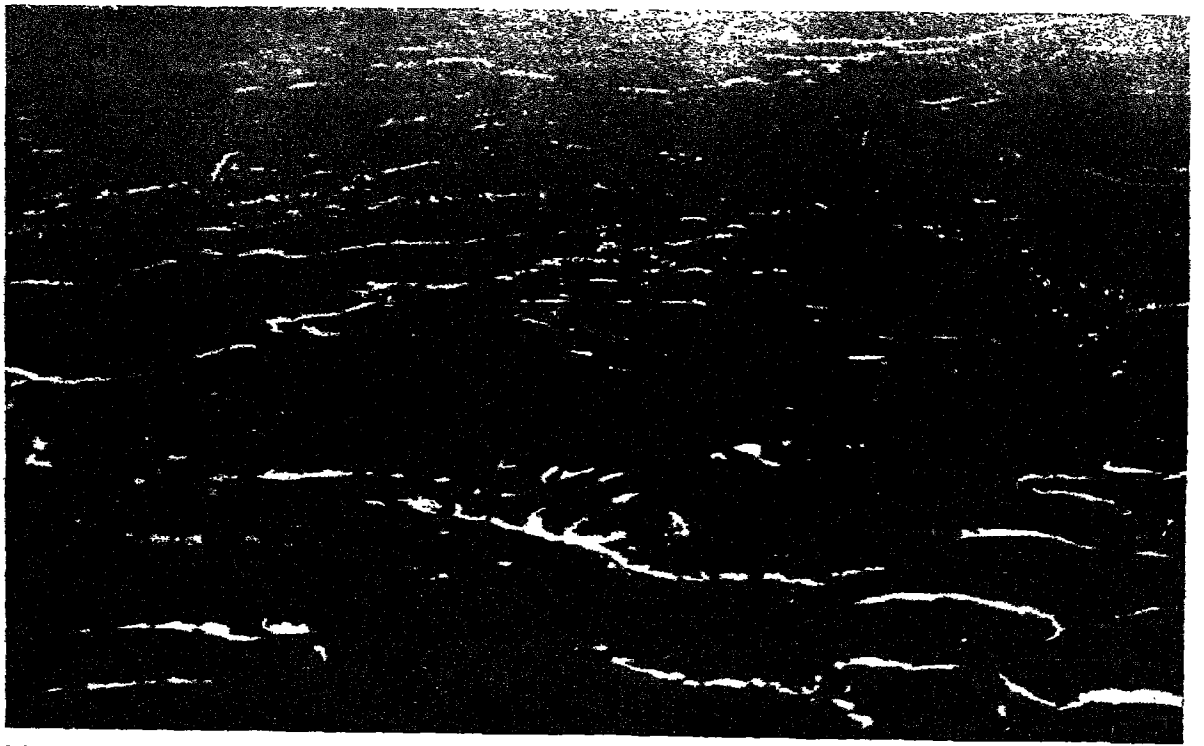
The equipment of the station turned out to be completely suitable on the whole, despite the absolute novelty and peculiarity of the conditions under which we are living. Our gigantic felt boots, equipped with deep goloshes, which looked so absurd on the mainland, here came into their own: they keep our feet warm in their fur stockings. Our shirts of reindeer fur and our sealskin trousers were very good and comfortable to work in. However cold it was outside during the night we were warm enough in our excellent wolfskin sleeping-bags. In the event of extreme low temperatures we have in addition further sleeping-bags and sleeping-suits of very light eiderdown.

Our black living-tent looks sombre from the outside but inside it is a cosy, warm house. It consists of a duraluminium frame on which is stretched a double covering of canvas. Soon we shall add the third covering of down, as the frosts

are already beginning. The floor is covered with reindeer skin on which we sit cross-legged or lie down at full length. In addition to two tiers of two cots each the tent holds the whole wireless station, our meteorological instruments and the hydrochemical laboratory. Of course it is rather a tight fit, but it is comfortable enough.

Our wireless station has long ago exceeded its projected capacity. It was made in the wireless laboratory of the Leningrad regional office of the People's Commissariat for Home Affairs. Although our station is of only 20 watts, Ernst Krenkel is in constant and reliable contact with the neighbouring Polar stations. There is also a more powerful (50 watt) transmitter which we have not yet had occasion to use. In his leisure hours Krenkel has short-wave conversations with the whole world. There was even one wireless amateur of Southern Australia among his contacts. The energy needed for our wireless station has been obtained by two methods: a transportable wind-motor constructed by engineer Perli, which begins to supply current as soon as the velocity of the wind exceeds 3 metres per second; a light-weight but unfortunately not very reliable petrol engine is in reserve in the event of a long period of calm. In the last three months this engine was needed only six hours in all, during the time of the trans-Arctic flights, when we wanted all the energy we could get.

At first we proposed to transmit weather reports once a day, but the reliability of our wireless transmitter permitted us to increase this number to four per day. During the flights made by Chkalov and Gromov our weather observations were wirelessed to the mainland every three hours. On days when there was a strong wind Krenkel transmitted entire articles for the newspapers, but when the weather is calm we are very thrifty with our energy and try to use the unreliable petrol engine as little as possible.



24

THE RETURN TO THE SOUTH
The USSR-N-171 above the Spring Tundra

The supply of concentrated food was thought out with great care. We decided to break away from the classic pemmican and chocolate of former Polar expeditions, because this food is extremely monotonous for constant use throughout a year. The Director of the Institute of Public Nutrition, Comrade Beliakov, and his assistants, eagerly tackled the job of working out a diet which should be concentrated, nutritive and at the same time of sufficient variety. The products prepared by the Institute consist of soups, jellies, and meat concentrates which give a varied and easily prepared meal. The only failure was the chicken powder. In addition to concentrated foods we took with us fresh meat and fish, cereals and flour, as these are considerable aids to nutrition. Unfortunately most of the fresh meat went stale and had to be used as food for our dog.

I think it is quite safe to say that no Polar expedition has ever fed as well as we are doing. In general we live under very satisfactory conditions. The only thing we lack is time. We must cope with a volume of work for which ten persons are available at a normal Polar station. For this reason we do not get enough sleep.

In addition to intensive scientific work we have to spend much time and care in keeping our camp in order. In summer, as already mentioned, water caused us a great deal of trouble. We had to shift our supply bases and rescue our living-tent from submersion. During the last ten days conditions have suddenly changed; the frosts have covered all pools with a thick layer of ice and a blizzard has blown a covering of snow over everything. The assistance we can give to the search for Levaneski's aeroplane consists in this: the wireless station is on the watch for signals from the 'plane all round the clock. For several days Krenkel lived on black coffee. The others spent several days of about sixteen hours each in preparing an aerodrome

for the aeroplanes led by Comrade Shevelev, which had set out from Moscow. At present there are two good landing-fields ready on our floe.

This compelled us to restrict to some extent our scientific work at the end of August. During the last few days Shirshov and Feodorov have been ignoring time and using the present good weather to catch up on what they missed. Krenkel and myself, in the interests of scientific research, have excused our comrades from participation in kitchen and all other fatigues. So that at present Shirshov and Feodorov can spend all their time in scientific observations.

During the last few days we have again been engaged in major constructional work. We are erecting a huge ice building to house the kitchen. Snow sprinkled with water serves as excellent material, and frost quickly turns the walls to stone-like hardness. Further, we are substituting an ice storehouse for the present tent. If our new building material proves all right we shall build ice-huts to replace all tents up to now used for scientific work. The strong winds here put too great a strain on the tents and they are eternally in need of repair.

The sun is circling very low over the horizon and will soon set altogether. The Polar night, which lasts five months, is approaching. Despite hard work we all feel very well and fit. With the exception of a few tablets of pyramidon all our medical supplies have remained untouched.

We are full of strength and energy. Our country's flag is now planted at the North Pole. We shall keep it flying and carry it forward through the Arctic wastes. We regard it as a matter of honour to fulfil the pledges we have given to our country and to our dear Josef Vissarianovich Stalin.
I. Papanin.

29

Scientific Work at the North Pole

North Pole Station, September 9th. Here are the main results of the work of the drifting station during August.

August was marked by a considerable change of position of our ice-floe—we moved seventy miles in a straight line, at an average speed of drift of 2·3 miles a day. The drift was particularly rapid from the 7th to the 12th of August: in five days the floe travelled forty miles. The laws governing the relation between the direction of the wind and the direction of the drift, which we had established in June, were maintained in their general features also during August.

The average temperature of the air in August was +1·2°. The highest temperature was +0·9°, and the lowest −7·9°.

In the last ten days of August the temperature was permanently below zero, and a snow layer began to accumulate over the ice. Pools and lakelets on the surface of the ice-fields were covered with a thin layer of fresh ice about two inches thick. Blizzards began to fill in the holes and gullies which had formed during the summer, levelling out the surface of the ice-floe.

At latitude 87° 10′ North and longitude 1° East we carried out a series of measurements of the depth of the ocean. It was here a little less than at our former positions—14,285 feet.

A small quantity of silt taken from the bottom of the sea consisted of two layers, the upper one reddish-brown, and the lower grey.

In the course of August three hydrological stations were established: two at a depth of 3,300 feet and one at 13,120 feet. The deep station, started on August 10th, was made

useless by the rapid drift, which pinched the cable lowered through the ice. The temperature and salinity of the water from these stations, taken between 88° and 87° North, proved in general to be the same as in the more northern latitudes; here also, under a thick layer of cold water, there was a powerful flow of warm Atlantic water. With our special instruments—water-meters—we carried out regular observations of the speed and direction of the currents, especially those produced by the drift of the ice.

During August we established three hydro-biological stations. One was at a depth of 3,300 feet, and the other two were in the surface layers.

We found abundant vegetable plankton in the surface layers of the sea, and observed the so-called spring-flowering of the plankton. We estimated the quantity of plankton by the quantity of chlorophyll contained in the cells of the seaweed.

We made a number of measurements of the magnetic variation and of the horizontal component. We also made measurements of the force of gravity. *I. Papanin, E. Krenkel, E. Feodorov, P. Shirshov.*

30

A Working Day on the Ice-floe

North Pole, September 28th. As each of us is on duty at different times for scientific observation and work in the course of the twenty-four hours, we sleep at different times. We all meet, however, at the midday meal—about 3 p.m.

I always take the night watch—from midnight to 6 a.m. At ten minutes to six I call Feodorov to take the first morning meteorological observations. Soon he is preparing his report, crouching over his instruments. The book with the weather code is already in a dreadfully disreputable

condition, but we know by heart the code words for such everyday phenomena as "fog", "snow", "visibility nil" and need not have recourse to the code-book.

At 6.15 a.m. a thin voice from Rudolf Land asks for the weather. The switches of the transmitter click smartly and the apparatus hums in a low even bass. In contravention of all the rules of the wireless service, we exchange news with Stromilov, wireless operator at Rudolf Land, and tell each other what we have heard on the wireless.

In the meantime Feodorov has already boiled the kettle and fried a whole mountain of sausages. We drink our tea in the living tent—otherwise our butter, cheese and caviare would be made uneatable by the frost. We soak our biscuits so that our animated crunching will not disturb the sleeping Papanin, who, as he puts it, sleeps like a hare.

Each of us has his own unbreakable cup and saucer. This arrangement saves us washing up, which is merely a waste of hot water and consequently of fuel. Sometimes the morning tea is interrupted to verify the chronometers, or by the sudden appearance of the sun, which makes immediate astronomical observations necessary.

After breakfast Feodorov retires to his ice "study" or remains in the tent, and digging into notebooks, books of reference, tables and charts makes some sort of calculations. For me the blissful moment has arrived when I can crawl into my sleeping-bag. I am sorry I lack poetic talent. Somebody ought to write an ode to our sleeping-bag, our paraffin, our splendidly functioning Primuses. At about nine o'clock Papanin and Shirshov get up. Neither of them are bound by a merciless schedule and can therefore afford to pamper themselves in their sleeping-bags. Shirshov has invented the following method of training himself to get up quickly. When he goes to bed he hangs up a piece of chocolate above his head. Whoever wakes him at the same

time starts a stop-watch. If within five minutes Shirshov's feet have not touched the ground the chocolate is forfeit.

When I wake, and before I have managed to open my eyes, I already hear that Papanin is still up. I hear the clash of sheet metal as he makes trays of all shapes and sizes. I hear the roar of his blow-lamp as he cleanses the stopped-up Primuses with fire. I hear the crunching of the snow as the irrepressible Ivan Dmitrich digs into it. Fuel, reserve bases, lamps, and all repairs are the sphere of Papanin's untiring activity. Even when the ice-breaker's smoke is already over our floe, Papanin will without doubt still be worrying about his stores and hurriedly wiping the glass globe of the paraffin lamp just once more.

Shirshov spends whole days in his tent near the whole in the ice. We joke in a friendly way about his fastidiousness. Almost every fortnight he lightly smears his face with water. We ourselves dare not go to such lengths. We are afraid of producing variegated stripes on our faces. Smeared with oil and grease, with hands blue from the icy water, he is accumulating extremely interesting material from his observations.

It is very difficult to warm frozen cereals and soup without burning them. Our cooking must conform to two fundamental requirements: that the food should be as hot as possible and that the amount of fuel used should be as little as possible. If he succeeds in this the cook on duty is given a good mark. After the meal we rest for an hour and then continue the work in hand.

Our tent is very cosy. Round about ten o'clock, when we take our evening tea, Fedorov is already asleep and we three drink tea. The main subjects of our conversations are Spain, China and Moscow. An earphone is hung up above each bed. At 11.30 we can hear Moscow very loudly and very distinctly.

I go outside to take the routine weather observation. When the sky is clear the cold is particularly perceptible. It is pleasant to see the calm brilliance of the moon and the twinkling of the stars. The horizon is hidden by the frosty darkness. There is no wind—that means that the night watch will be quiet and that from Papanin's sleeping-bag the question: "How's the wind?" will not be asked.

Nearly every station in Europe can be heard here with deafening loudness. Recently it has been difficult to get in touch with Rudolf Land during the night, because the transmission from there is drowned by music from Budapest.

Once every hour I make the rounds of the camp, avoiding familiar stumbling-blocks in the darkness. Our aerial is like a thick rope, it is covered with the fur of an incredibly thick rime. Our dog snarls in his sleep. He is obviously having a bad dream. All round lies a sonorous stillness, rarely interrupted by the cracking of the ice, as if everything in the world were frozen stiff. Yet the ether is loud with music of every kind and the water-meter we shall lower into the water at 5 a.m. will again show that our ice-floe is drifting southward despite the calm.

At 5.30 a.m. I listened in to a snappy march tune from Moscow. I am horrified by the instructions given by the physical fitness expert who says "Open the window and put on your shorts." The recommended hydrotherapeutical procedure is applied by us in the only way possible up here: we drink hot tea. *E. Krenkel.*

APPENDIX

APPENDIX

THE EQUIPMENT OF THE DRIFTING STATION

THE AEROPLANES CARRIED to the North Pole for the Papanin station about ten and a half tons of various equipment, supplies and instruments. There was everything. Food, instruments, components of the buildings which were to form the future settlement, kitchen accessories, electric installations, wireless material, weapons, ammunition, etc. etc. etc.

Here is an almost complete inventory of the North Pole drifting station:

1. Main wireless transmitter.
2. Spare transmitter.
3. Two aerial masts.
4. Mast and vanes for the wind-motor.
5. Petrol engine with spare parts.
6. Hand-driven dynamo.
7. A set of batteries.
8. Aerial wire, counterweights, cables, supports for the masts, spare parts for the wind-driven power station, wireless parts, tripods, iron anchors.
9. Eiderdowns (80 lbs.).
10. Reindeer skins (15).
11. Inflatable rubber floor covering for the tents.
12. Canvas pallets on aluminium frames.
13. Silk tents (4).
14. Skis (10 pairs).

15. *Clothing:* Combinations, wolfskin stockings, reindeer shirts, woollen sweaters, woollen socks and stockings, woollen gloves and mittens, wolfskin mittens, woollen underwear, silk underwear, fur shoes, fur caps, fur helmets, reindeer-fur trousers, leather breeches, canvas breeches, canvas tunics, reindeer-fur shoes, wolfskin shoes, felt boots, fox-fur coats, summer helmets, goloshes for the felt boots, leather boots, silk sleeping-suits.
16. Fur rugs for the tent.
17. Silk sleeping-bags of eiderdown with wolf fur.
18. String, leather straps, steel cables, silk rope.
19. Toilet soap (14 lbs.), tooth powder (20 lbs.), tooth-brushes, eau de Cologne, towels.
20. Notebooks (50).
21. Books.
22. Paraffin stoves, lighters, Primus needles, sewing needles, aluminium kitchen utensils, non-fragile crockery, cutlery.
23. Folding table and folding chairs (5 lbs. in all).
24. Tobacco (70 lbs.).
25. Pencils, pens, knives, mouthpieces, razors, hair-clippers, scissors, ink powder, buttons, thread.
26. Motor oil (115 lbs.).
27. Methylated spirit (110 lbs.).
28. Main living tent.
29. Sledges.
30. Shovels, picks, axes.
31. "Bat" lamps.
32. *Scientific instruments:* Eckman water-meters, tube for sea-bottom, magnetic variometers, magnetic theodolite, chronometers, aviation sextant, aviation octant, hydrological recorder, equipment for the hydrochemical laboratory, microscopes, spectro-

scope, automatic recorder, anemograph, storm meter, plankton nets, hydrological windlass with 16,000 feet of cable, bathometers, Kusnetsov water-meter for determining the direction of currents, equipment for the meteorological tent, spare parts for the instruments.

33. Portable moving-picture camera, photo-kino accessories.
34. Rifles and ammunition, revolvers.
35. Collapsible boat and rubber floats.
36. Lemon juice (3 cans).
37. Food in standard cans (about 6 tons).
38. Pork (170 lbs.).
39. Sausage (450 lbs.).
40. Butter (440 lbs.).
41. Bacon (680 lbs.).
42. Fresh milk (6 bottles).